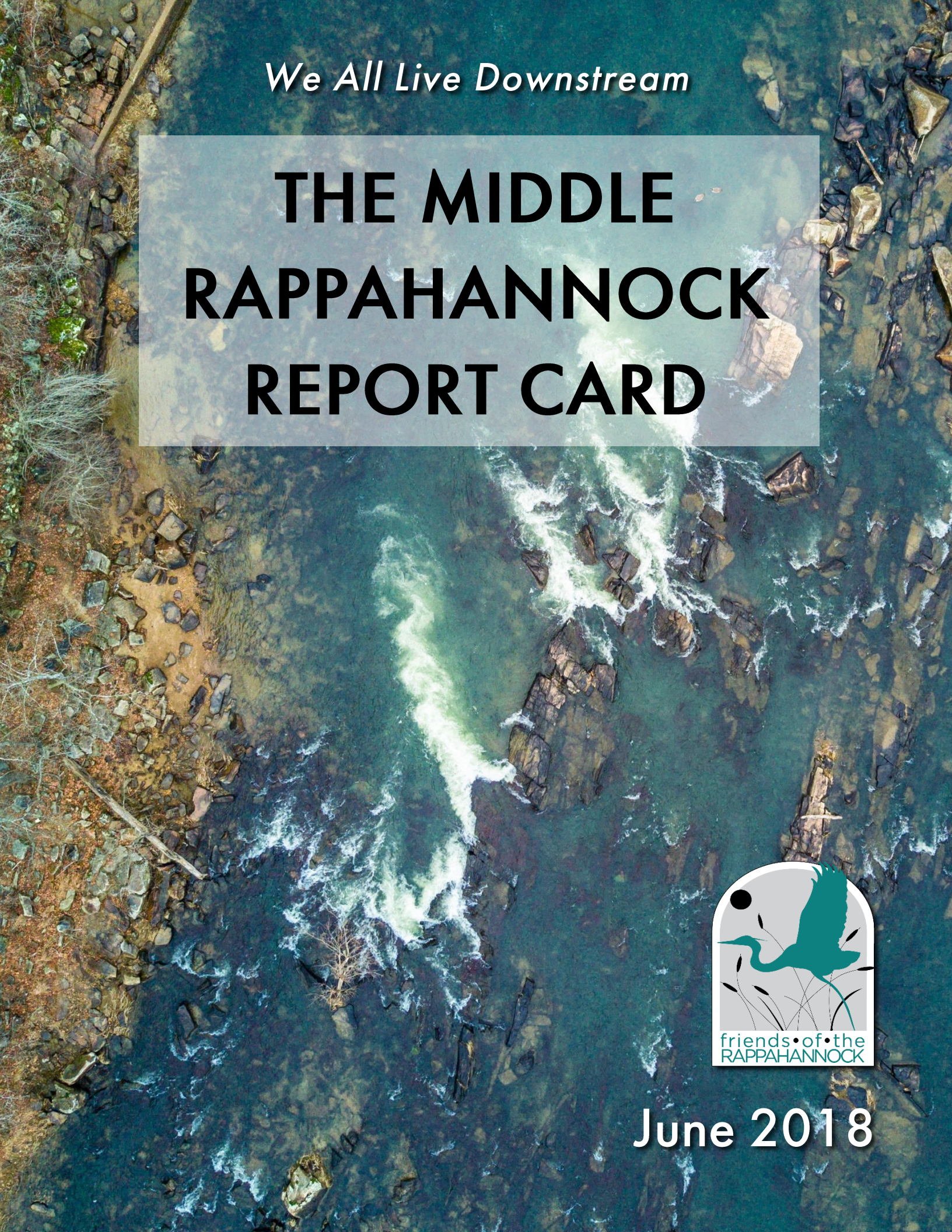
We All Live Downstream

THE MIDDLE RAPPAHANNOCK REPORT CARD



friends•of•the RAPPAHANNOCK

June 2018

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Acknowledgments

Friends of the Rappahannock would like to thank the Community Foundation of the Rappahannock River Region for providing the grant funding and strategic vision for the Middle Rappahannock Report Card. Special thank you to all Friends of the Rappahannock staff who were involved in the planning, production and outreach in support of the document, including Adam Lynch, Bryan Hofmann, Joellen Santulli, Daria Christian, Kathleen Harrigan, Lowery Becker, and Meredith Palumbo. Thank you to David Nunnally and other partners for their advice along the way. And finally, thanks to our GIS support staff, Asa Vegodsky and Emily Fennell, for all their hard work in the lab.

Dear Reader,

Nearly everyone who grew up in the Fredericksburg area has a story to tell about the Rappahannock River. Many of us have cherished memories of childhood summers fishing, paddling, or swimming in the river and the local creeks and ponds that feed it.

Often, those stories bring up how our lands and our waters have changed over our lifetime. Long-time residents remember when you could drive along Route 3 from the Spotsylvania Mall to Culpeper without hitting a stoplight, and when the river herring--now an imperiled species--schooled so densely at Old Mill Park you could catch them with your bare hands.

The Middle Rappahannock Report Card is a 21st-century attempt to quantify these observations, in order to help the community of Planning District 16 understand the condition of their waterways and the lands that surround them, now and into the future.

Improvements in geospatial technology have enabled land-cover analysis at the 1-meter resolution, helping to track changes in urban development and forest canopy cover with unprecedented precision. Meanwhile, data-rich government water quality monitoring programs reveal patterns and trends unknown to previous studies. By applying the Report Card model upstream and downstream along the Rappahannock, we hope to provide new and unique insights to communities throughout our watershed. This will help communities and their leaders keep the pulse of their local waterbodies and target stewardship action where it is needed most.

What we find may startle, shock or scare us, and perhaps it should. But we hope that this document will also highlight the good in our community's efforts. It will tell new stories, like the story of one Fredericksburg city school that went above and beyond by bringing their entire student body to a watershed education field trip over a two-year period, giving over 900 children an opportunity to understand our natural world at a far younger age than their parents' generation ever could.

That's the story of our Middle Rappahannock Report Card. We hope you enjoy it.

Sincerely,
Friends of the Rappahannock

This document was made possible by a generous grant from the Community Foundation of the Rappahannock River Region.

How to Use this Document

The River Report Card is intended to produce a set of baseline data indicators that will help Friends of the Rappahannock and other stakeholders monitor trends in water quality and watershed conditions now and in the future. The results of this document will equip community leaders, policymakers and administrators with the information they need to take targeted stewardship action on a local level.

Understanding the Grade

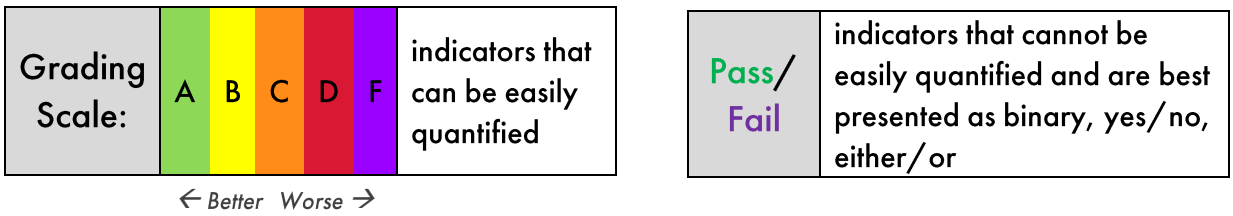
The overall grade in this Report Card is unique to the Rappahannock River watershed. The grade incorporates current water quality conditions and surrounding land uses, while also addressing challenges such as lack of community engagement or protective regulations, all of which are tailored to fit the tributaries of the Rappahannock River watershed. *The grade is not useful as a tool to compare the Rappahannock with other rivers.* Instead, the grade focuses on how the Rappahannock River watershed is performing within its specific context and geography.

The Report Card Model

Eleven tributaries within the 5 counties of Planning District 16 (Caroline, Fredericksburg, King George, Spotsylvania, and Stafford) were chosen to create a representative sample of streams in the Middle Rappahannock region. Each tributary was assessed on a total of 16 quantitative indicators of stream condition, which were grouped into the following categories:

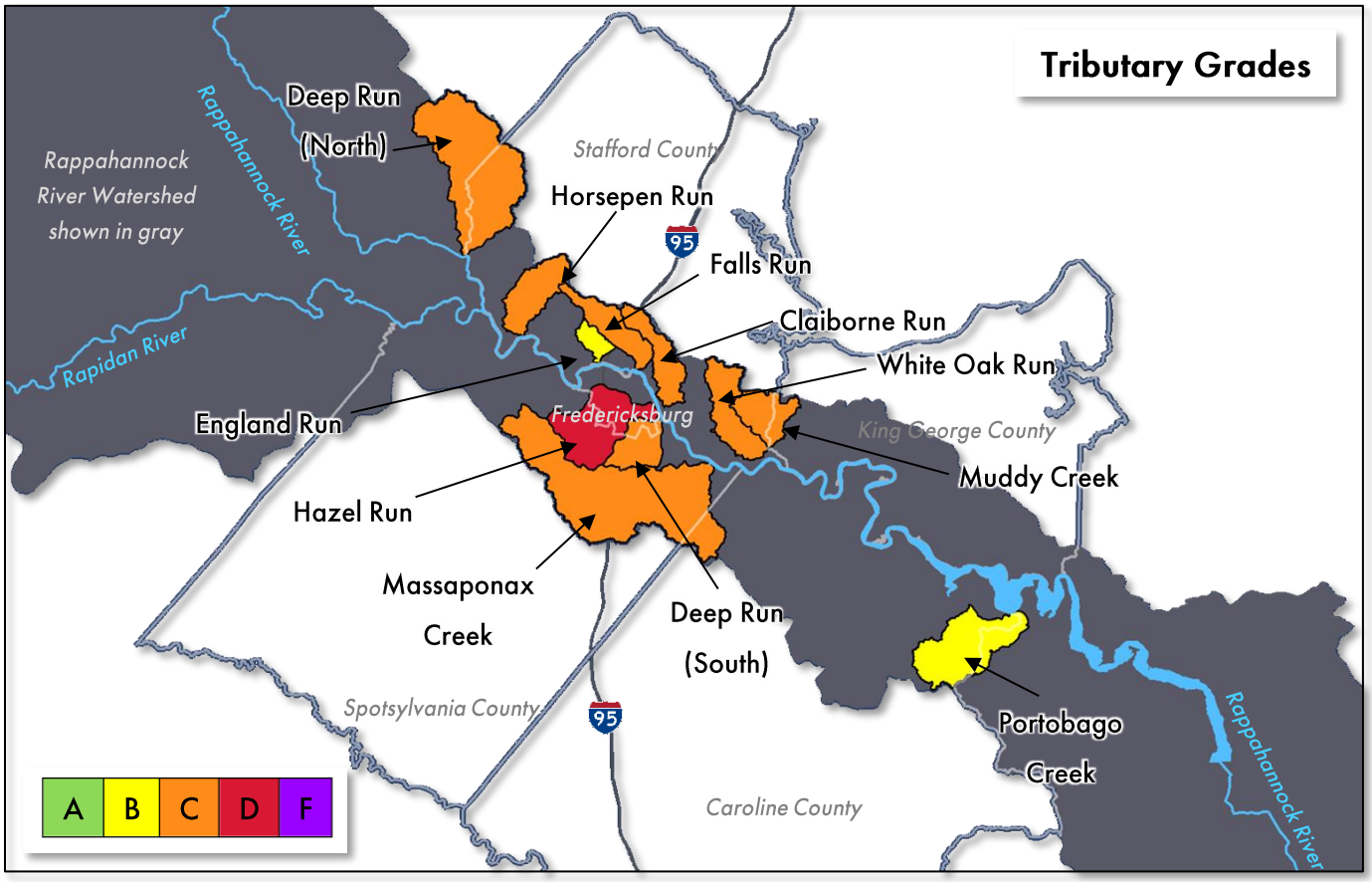
- **Human Health** – four indicators that indicate the health and safety of community members who interact with the river
- **Land Use** – four indicators that assess the current land cover, land cover protections, and the use of best-management-practices (BMPs) to treat pollutants from nonpoint source runoff
- **Stream Ecology** – four indicators that evaluate the ecological health of the stream environments, including a land cover assessment of all lands within 300 feet of perennial waterbodies
- **Community Engagement** – four indicators that gauge the current state of watershed education, stewardship action, and relationship between local communities and their streams

Each indicator was graded on one of the following scales:



For more information about individual grading scales. Methodology, and data sources, please see Appendix 1 of this document.

Report Card Results



Grades by Indicator

	Claiborne Run	Deep Run North	Deep Run South	England Run	Falls Run	Hazel Run	Horse Pen Run	Massaponax Creek	Muddy Creek	Portobago Creek	White Oak Run
Human Health	C+	B+	B	A	A	D	B+	C	A-	B+	B
Land Use	C	D+	C	D+	F	F	C+	D+	C	B-	C
Stream Ecology	D+	B	C-	B	C	D+	B+	C-	B-	B	C
Community Engagement	C	C	D+	B-	D	B+	F	C	C	C	F
Overall Tributary Grade	C	C+	C	B-	C-	D+	C+	C-	C+	B-	C

Overall Grades

B	Human Health
D+	Land Use
C+	Stream Ecology
C-	Community Engagement

C

Middle Rappahannock Region Grade, 2018

Caroline County Results

Portobago Creek Report Card

B-

Subject	Grade	Comments
Human Health	B+	• 7% of stream-miles have unsafe bacteria count • No Fish consumption advisories
Land Use	B-	• 49.2:1 forest-impervious ratio • No residential BMPs installed in the past 3 years*
Stream Ecology	B	• 19% of stream-miles listed as impaired for aquatic life • 97% of 300 foot buffers around perennial streams protected
Community Engagement	C	• 0% of road crossings marked • Public access through Fort A.P. Hill

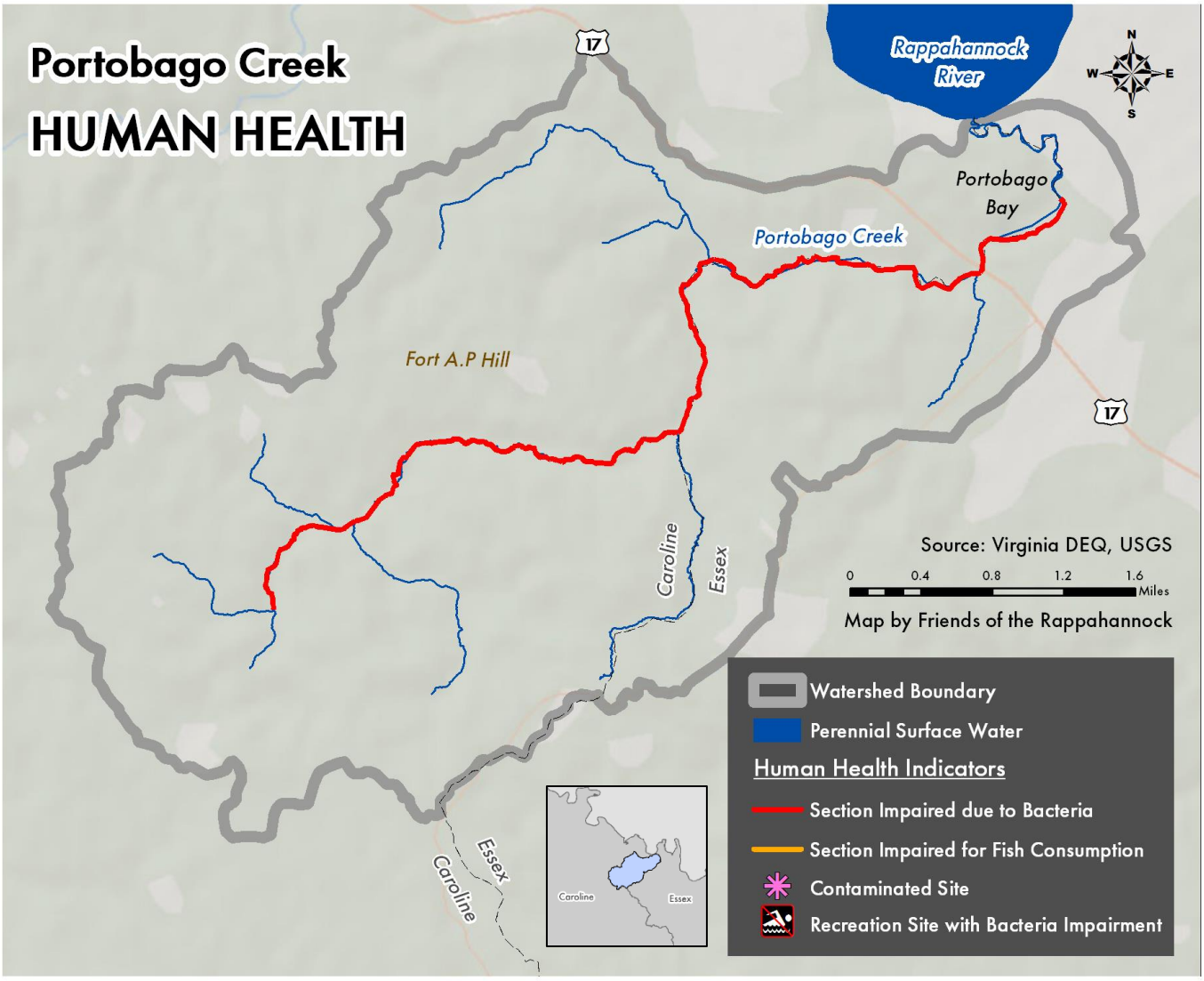
*Using state cost shares

Portobago Creek

HUMAN HEALTH: B+

Bacteria	Fish Consumption	Contaminated Sites	Recreational Health Risk
C	A	Pass	Pass
7.4% of stream-miles listed as impaired for recreation due to bacteria	0% of stream-miles listed as impaired for contaminated fish tissue	None	No impairment

For more information on indicators and grading scales, see Appendix 1

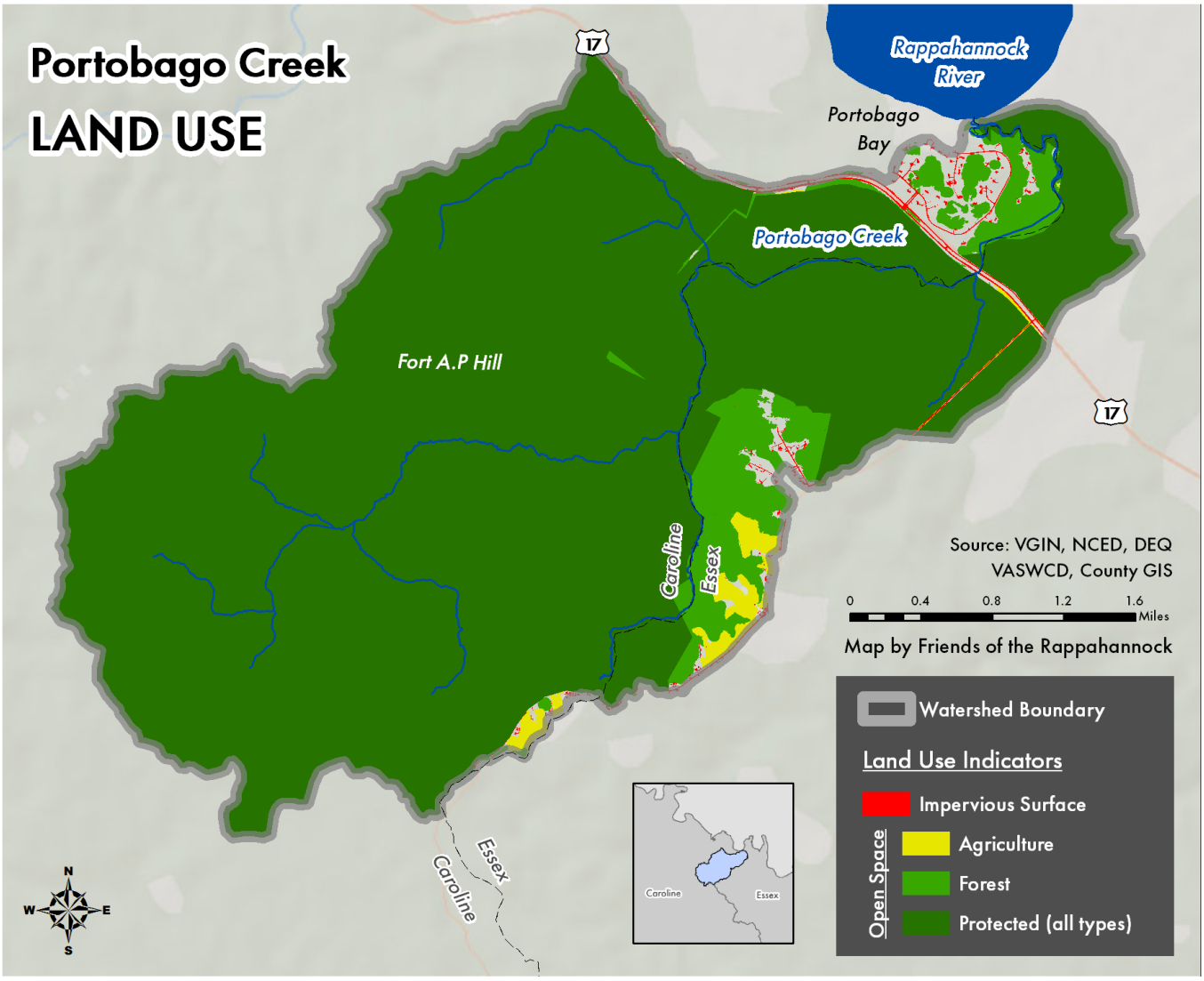


Portobago Creek

LAND USE: B-

A	A	B	F
Forest-Impervious Ratio	Open Space Protection	Agricultural BMPs	Residential BMPs
49.2 to 1 forest to impervious surface ratio	90.1% of open spaces under protection	22.6% of farmland treated by year, average 2007-2017	0 residential BMPs installed in past 3 years using state cost share

For more information on indicators and grading scales, see Appendix 1

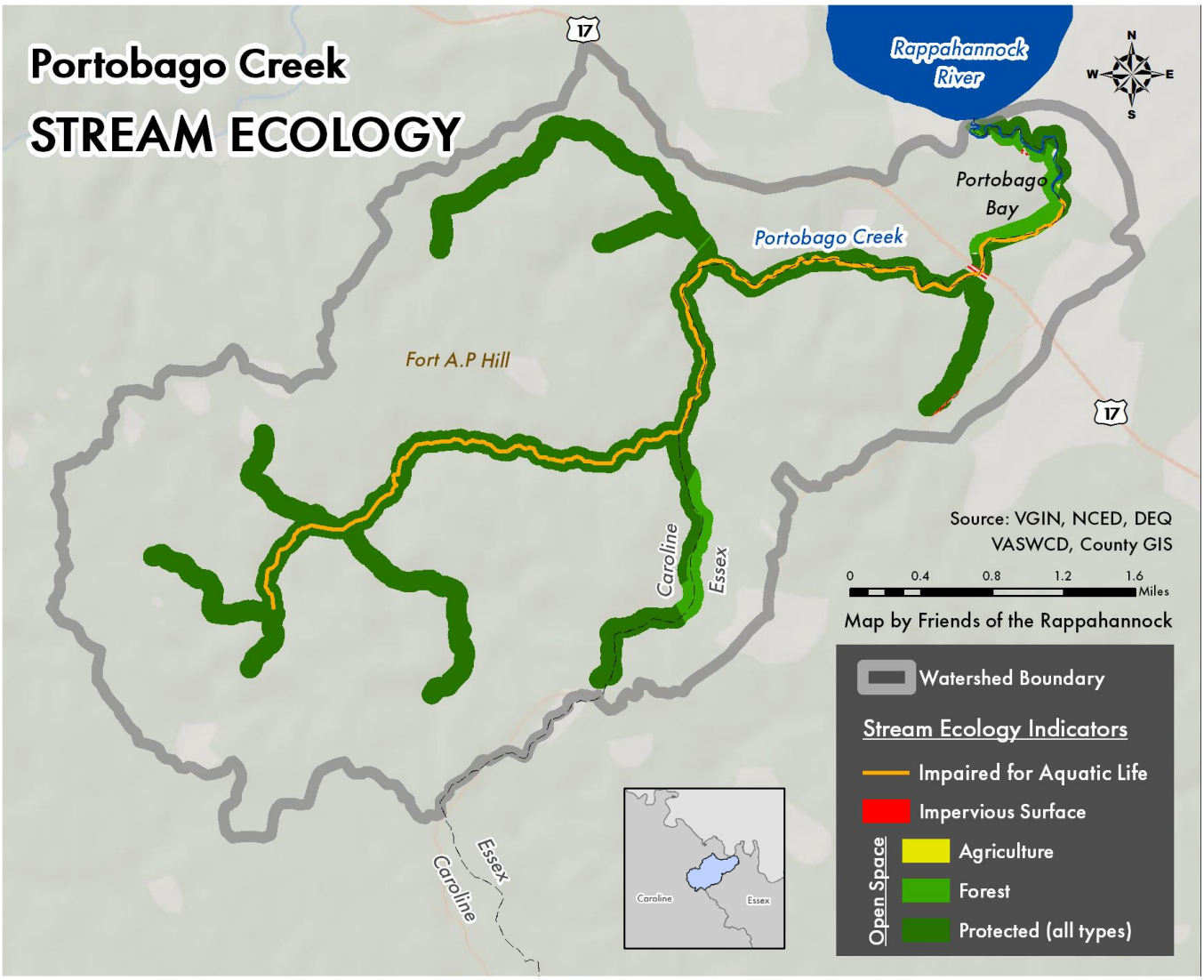


Portobago Creek

STREAM ECOLOGY: B

D	A	A	A
Aquatic Life	Impervious Surfaces	Forest Canopy	Open Space Protection
19.2% of stream-miles listed as impaired for aquatic life	.5% of land within 300 feet of perennial streams are impervious	92.6% of land within 300 feet of perennial streams are forested	96.5% of open spaces within 300 feet of perennial streams under protection

For more information on indicators and grading scales, see Appendix 1

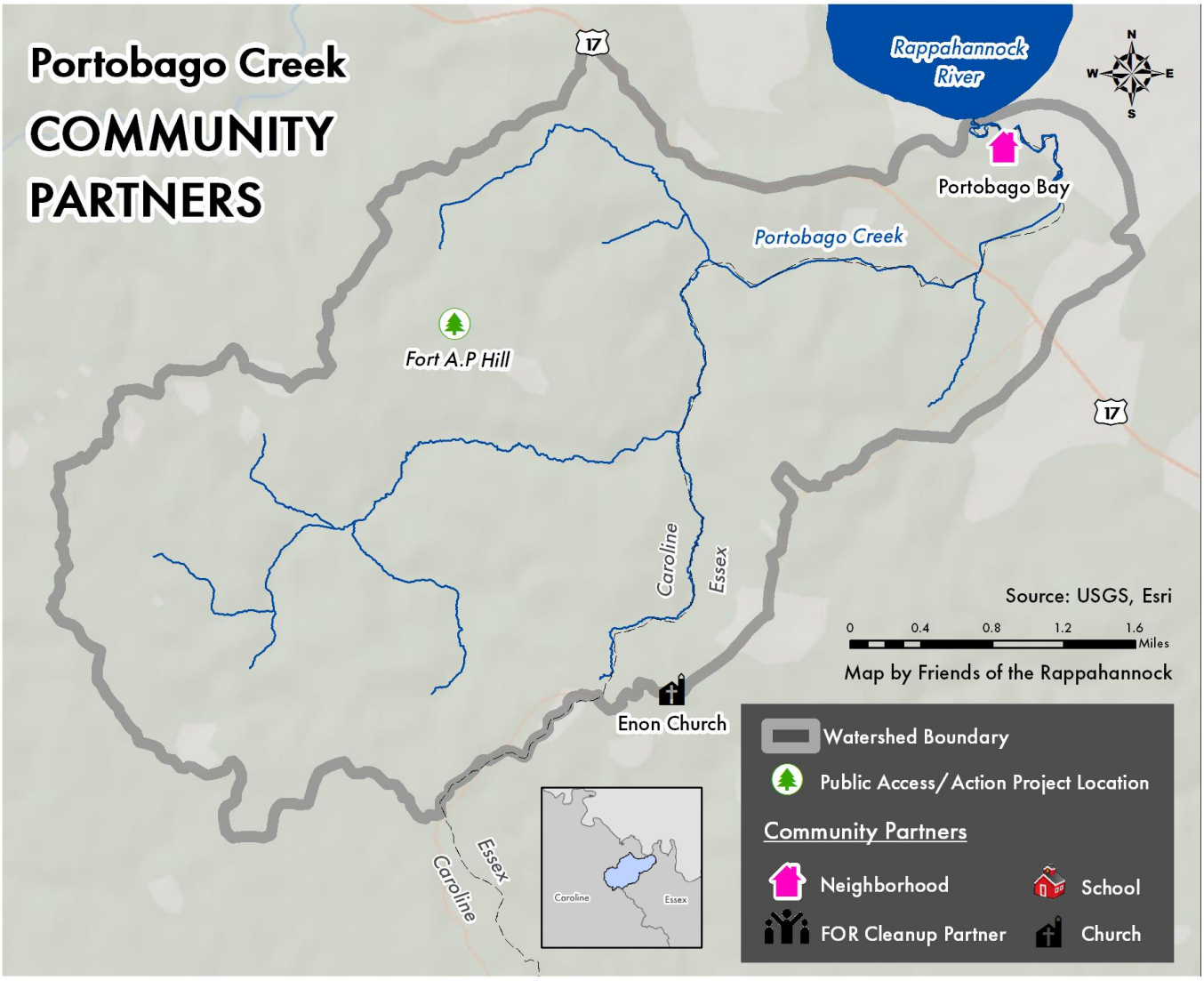


Portobago Creek

COMMUNITY ENGAGEMENT: C

Public Access	Watershed Education	River Cleanups	Road Crossing Signage
Pass	N/A	N/A	F
Access through Fort A.P. Hill	No schools in watershed	No public access for cleanups	0% (0 of 1) stream/road crossings marked with stream name

For more information on indicators and grading scales, see Appendix 1



City of Fredericksburg Results

Hazel Run Report Card

D+

Subject	Grade	Comments
Human Health	D	• 13.8% of stream-miles have unsafe bacteria count • Recreational Health Risk impairment at Alum Springs Park
Land Use	F	• 1.2:1 forest-impervious ratio • No residential BMPs installed in past 3 years*
Stream Ecology	D+	• 19.7% of stream-miles have degraded aquatic life • 43% of 300 foot buffers around perennial streams protected
Community Engagement	B+	• 50% of road crossings marked • 37% of K-8 public school students from this watershed attended FOR field trip in the past 2 years

*Using state cost shares

Hazel Run

HUMAN HEALTH: D

D	F	Pass	Fail
Bacteria	Fish Consumption	Contaminated Sites	Recreational Health Risk
13.8% of stream-miles listed as impaired for recreation due to bacteria	19.7% of stream-miles listed as impaired for contaminated fish tissue	No contaminated sites	Recreation impairment at Alum Spring Park

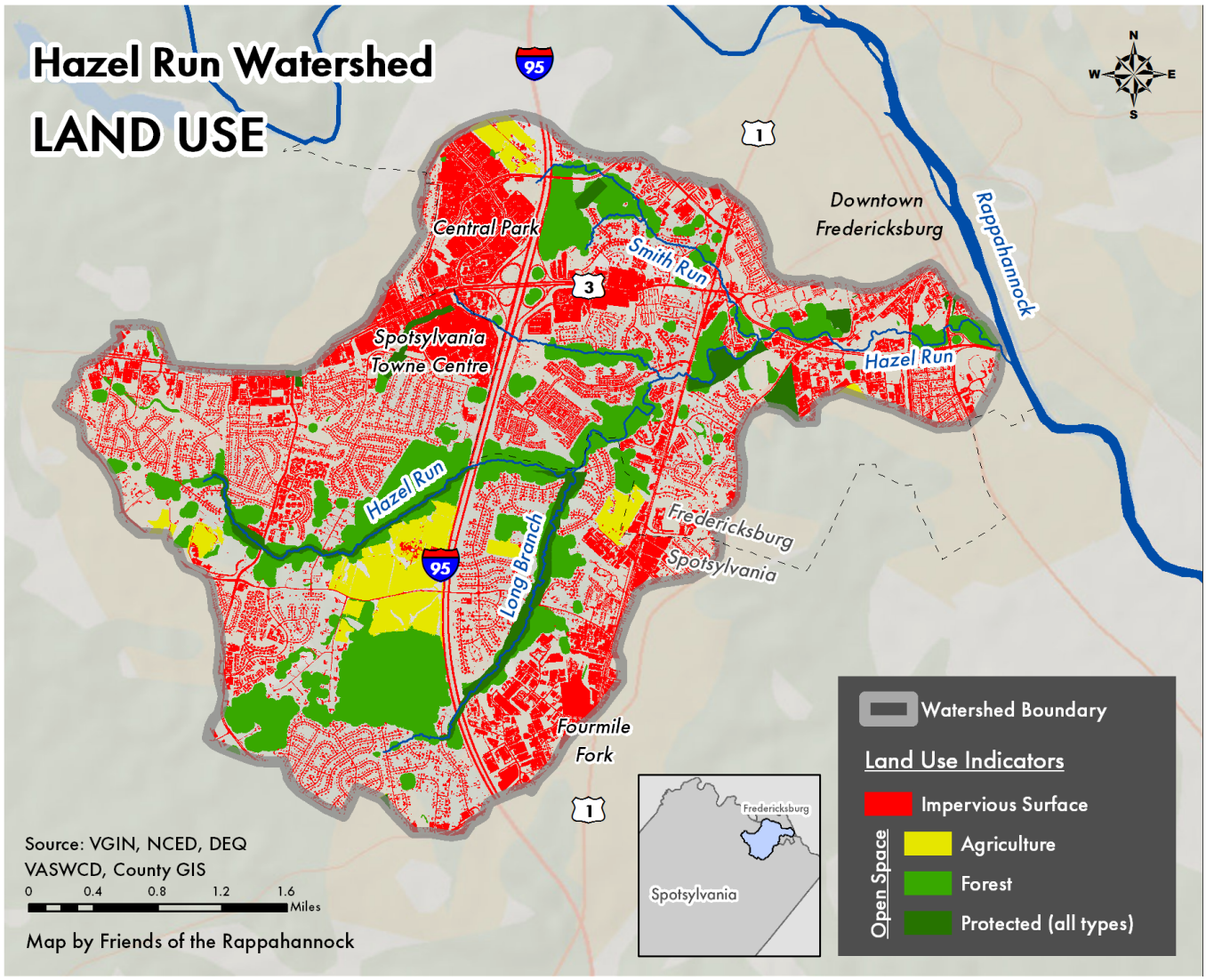
For more information on indicators and grading scales, see Appendix 1

Hazel Run

LAND USE: F

Forest-Impervious Ratio	Open Space Protection	Agricultural BMPs	Residential BMPs
F	D	D	F
1.2 to 1 forest to impervious surface ratio	13% of open spaces under protection	2.1% of farmland treated by year, average 2007-2017	No residential BMPs installed in past 3 years using state cost share

For more information on indicators and grading scales, see Appendix 1

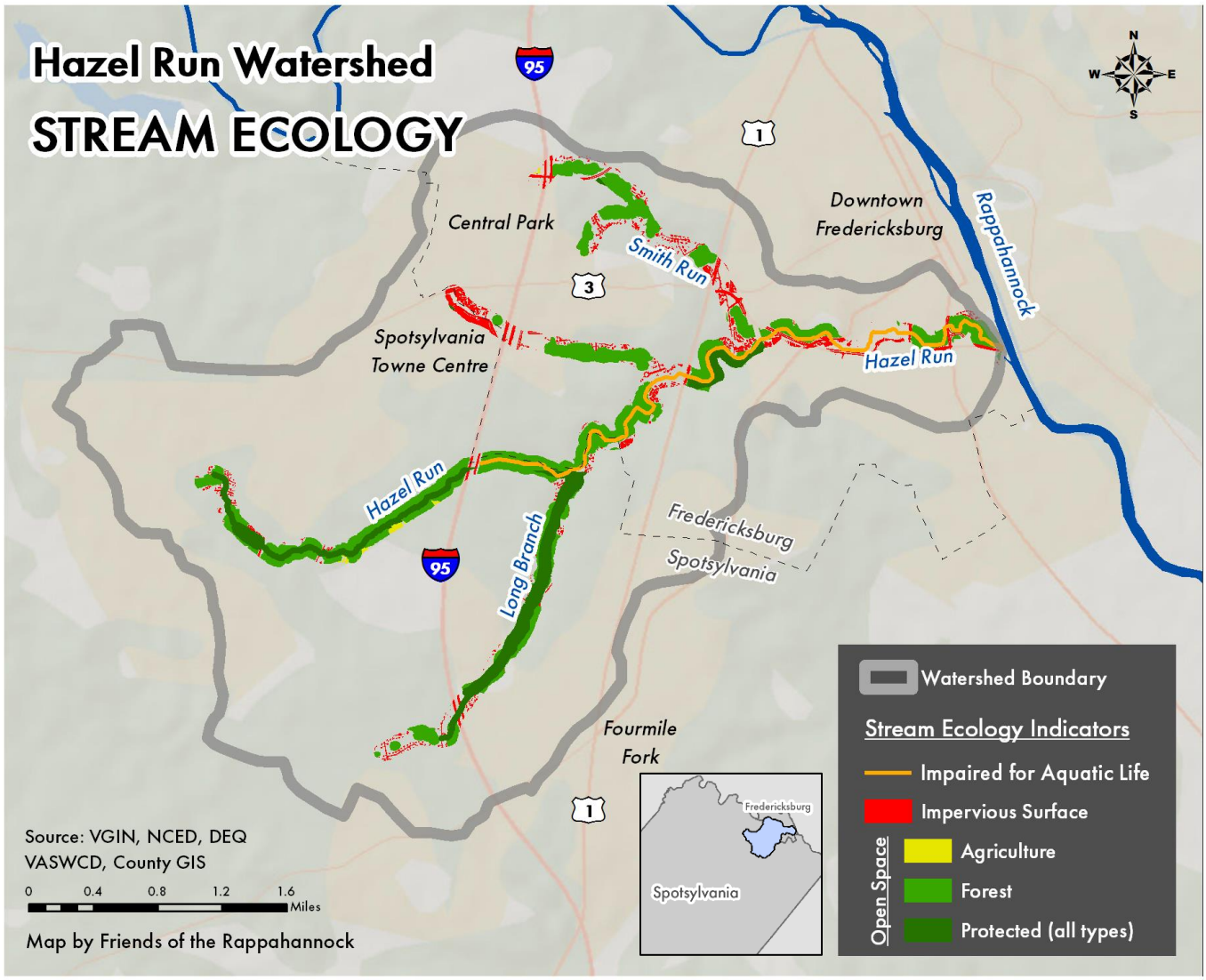


Hazel Run

STREAM ECOLOGY: D+

Aquatic Life	Impervious Surfaces	Forest Canopy	Open Space Protection
D	D	C	C
19.7% of stream-miles listed as impaired for aquatic life	12.7% of land within 300 feet of perennial streams are impervious	70.4% of land within 300 feet of perennial streams are forested	42.9% of open spaces within 300 feet of perennial streams under protection

For more information on indicators and grading scales, see Appendix 1

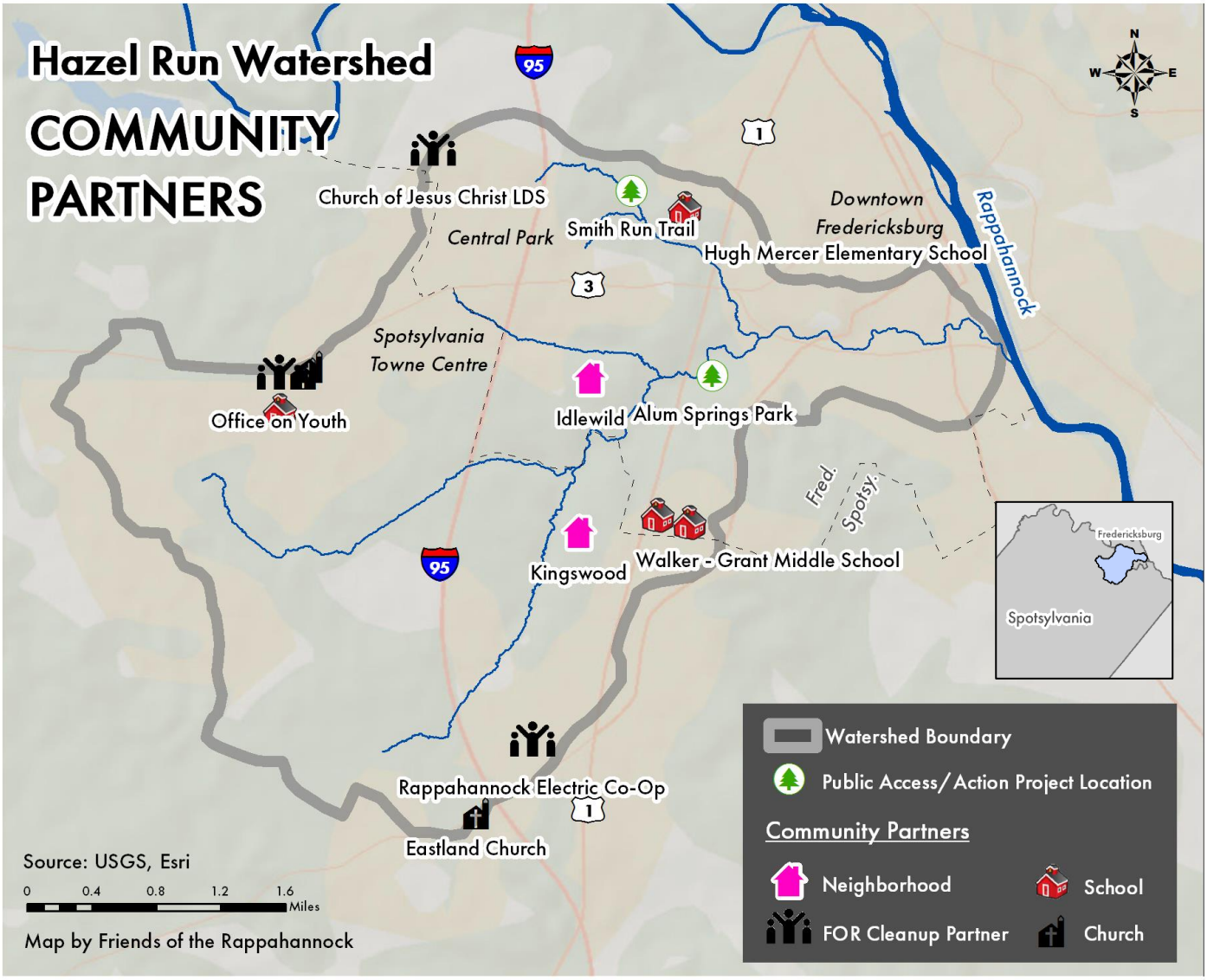


Hazel Run

COMMUNITY ENGAGEMENT: B+

Pass	B	B	A
Public Access	**Watershed Education**	**River Cleanups**	**Road Crossing Signage**
Public stream access Alum Springs Park, Smith Run Trail	37% of K-8 public school students attended FOR field trip in last 2 school years	0.8 FOR river cleanups per 10,000 population per year, 2015-2017	50% (3 of 6) stream/road crossings marked with stream name

For more information on indicators and grading scales, see Appendix 1



King George County Results

Muddy Creek Report Card

C

Subject	Grade	Comments
Human Health	A-	• 5% of stream-miles have unsafe bacteria count • No Fish consumption advisories
Land Use	C	• 15.6:1 forest-impervious ratio • No residential BMPs installed in the past 3 years*
Stream Ecology	B-	• 13% of stream-miles listed as impaired for aquatic life • 63% of 300 foot buffers around perennial streams protected
Community Engagement	C	• 50% of road crossings marked • No public access to streams

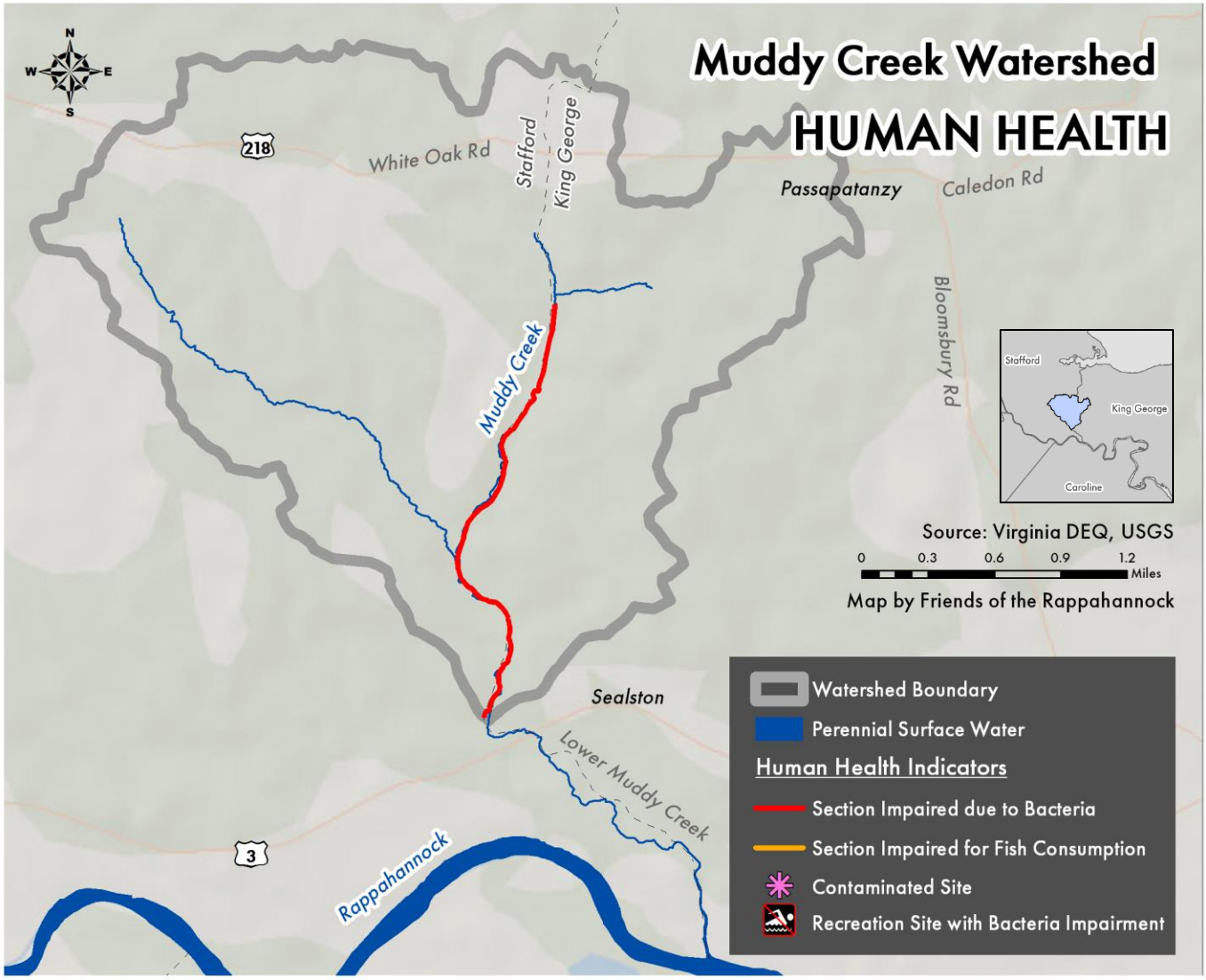
*Using state cost shares

Muddy Creek

HUMAN HEALTH: A-

B	A	Pass	Pass
Bacteria	Fish Consumption	Contaminated Sites	Recreational Health Risk
5% of stream-miles listed as impaired for recreation due to bacteria	0% of stream-miles listed as impaired for contaminated fish tissue	None	No impairment

For more information on indicators and grading scales, see Appendix 1

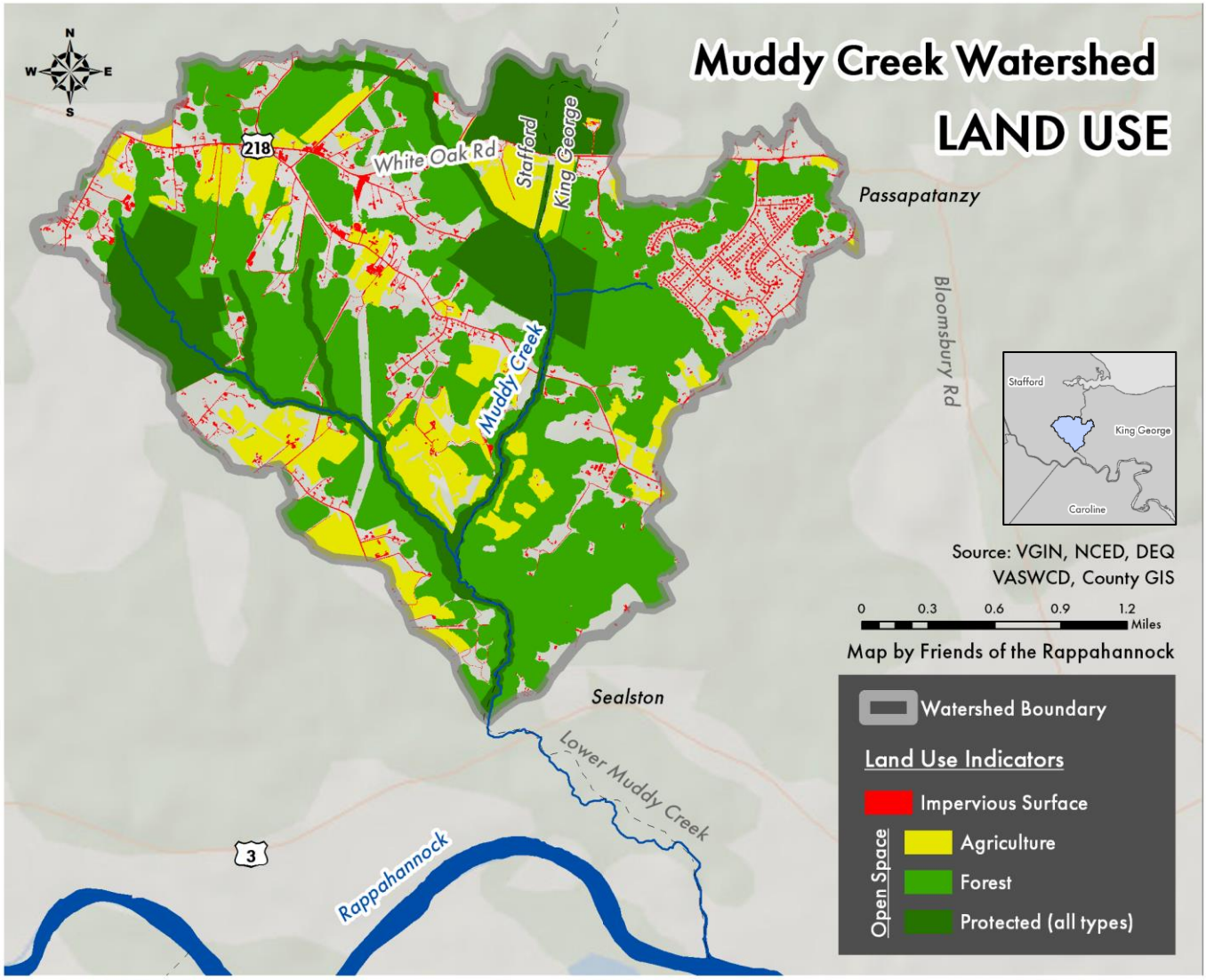


Muddy Creek

LAND USE: C

Forest-Impervious Ratio	Open Space Protection	Agricultural BMPs	Residential BMPs
B	B	C	F
15.6 to 1 forest to impervious surface ratio	20% of open spaces under protection	11.5% of farmland treated by year, average 2007-2017	0 residential BMPs installed in past 3 years using state cost share

For more information on indicators and grading scales, see Appendix 1

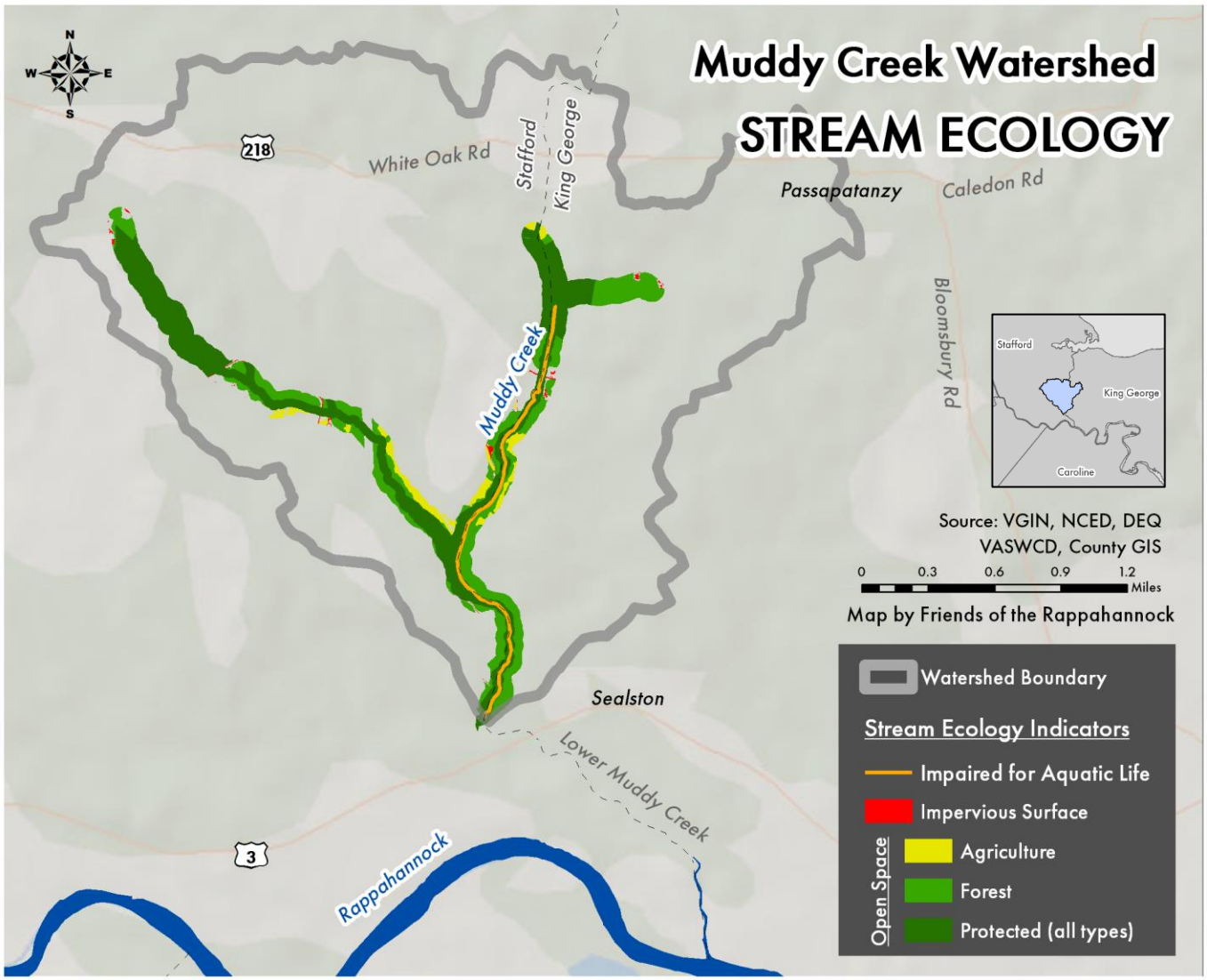


Muddy Creek

STREAM ECOLOGY: B-

D	A	B	B
Aquatic Life	Impervious Surfaces	Forest Canopy	Open Space Protection
12.8% of stream-miles listed as impaired for aquatic life	0.9% of land within 300 feet of perennial streams are impervious	84.9% of land within 300 feet of perennial streams are forested	62.8% of open spaces within 300 feet of perennial streams under protection

For more information on indicators and grading scales, see Appendix 1

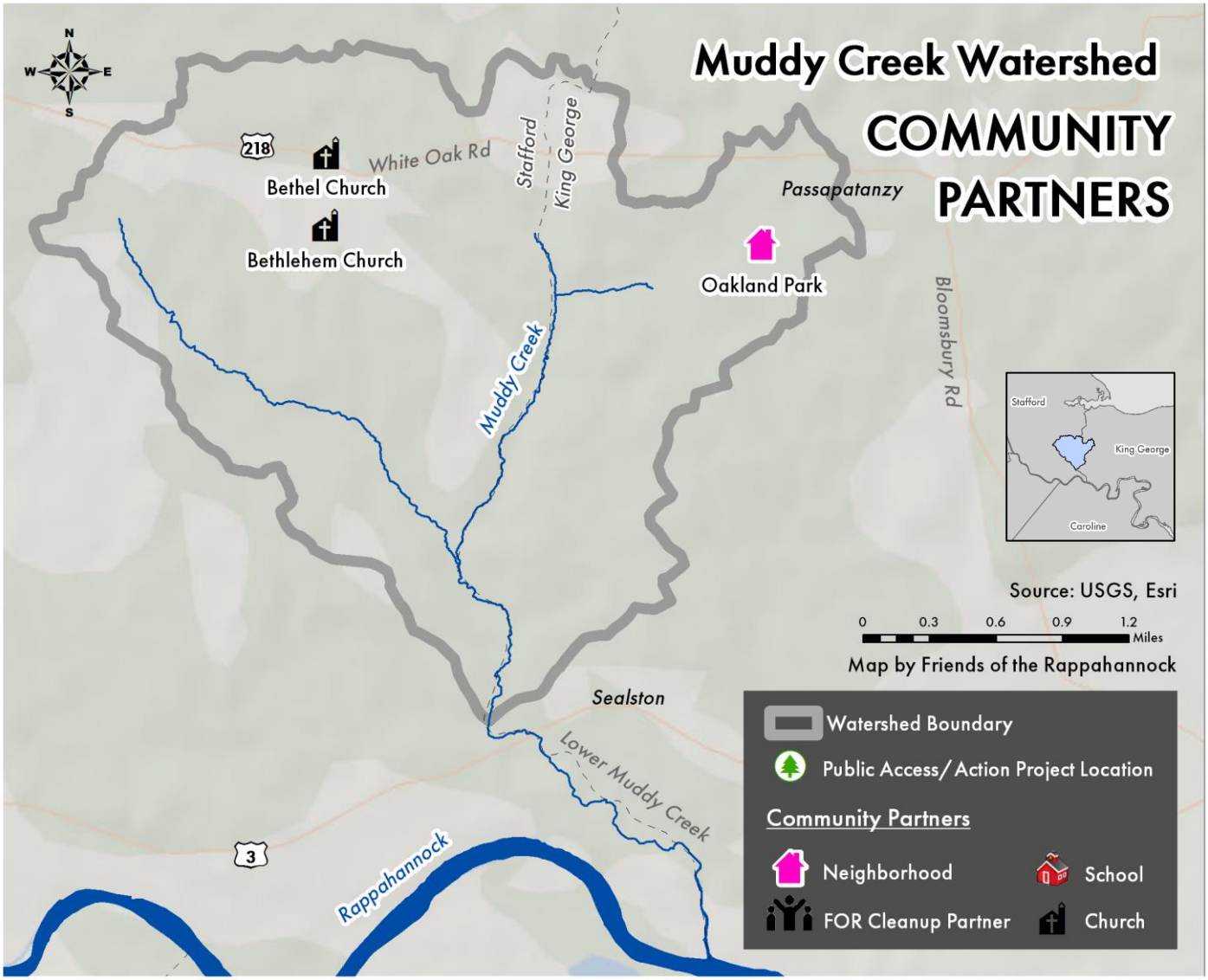


Muddy Creek

COMMUNITY ENGAGEMENT: C

Public Access	Watershed Education	River Cleanups	Road Crossing Signage
Fail	N/A	N/A	A
No public access points	No schools in watershed	No public access for cleanups	50% (1 of 2) stream/road crossings marked with stream name

For more information on indicators and grading scales, see Appendix 1



Spotsylvania County Results

Deep Run (South) Report Card

C

Subject	Grade	Comments
Human Health	B	• 0% of stream-miles have unsafe bacteria count • Active contaminated Brownfield site
Land Use	C	• 2.3:1 forest-impervious ratio • No residential BMPs installed in past 3 years*
Stream Ecology	C-	• 10% of stream-miles have degraded aquatic life • 80% of watershed is impervious surface
Community Engagement	D+	• 0% of road crossings marked • 0.5 FOR river cleanups per 10,000 population per year during past 3 years

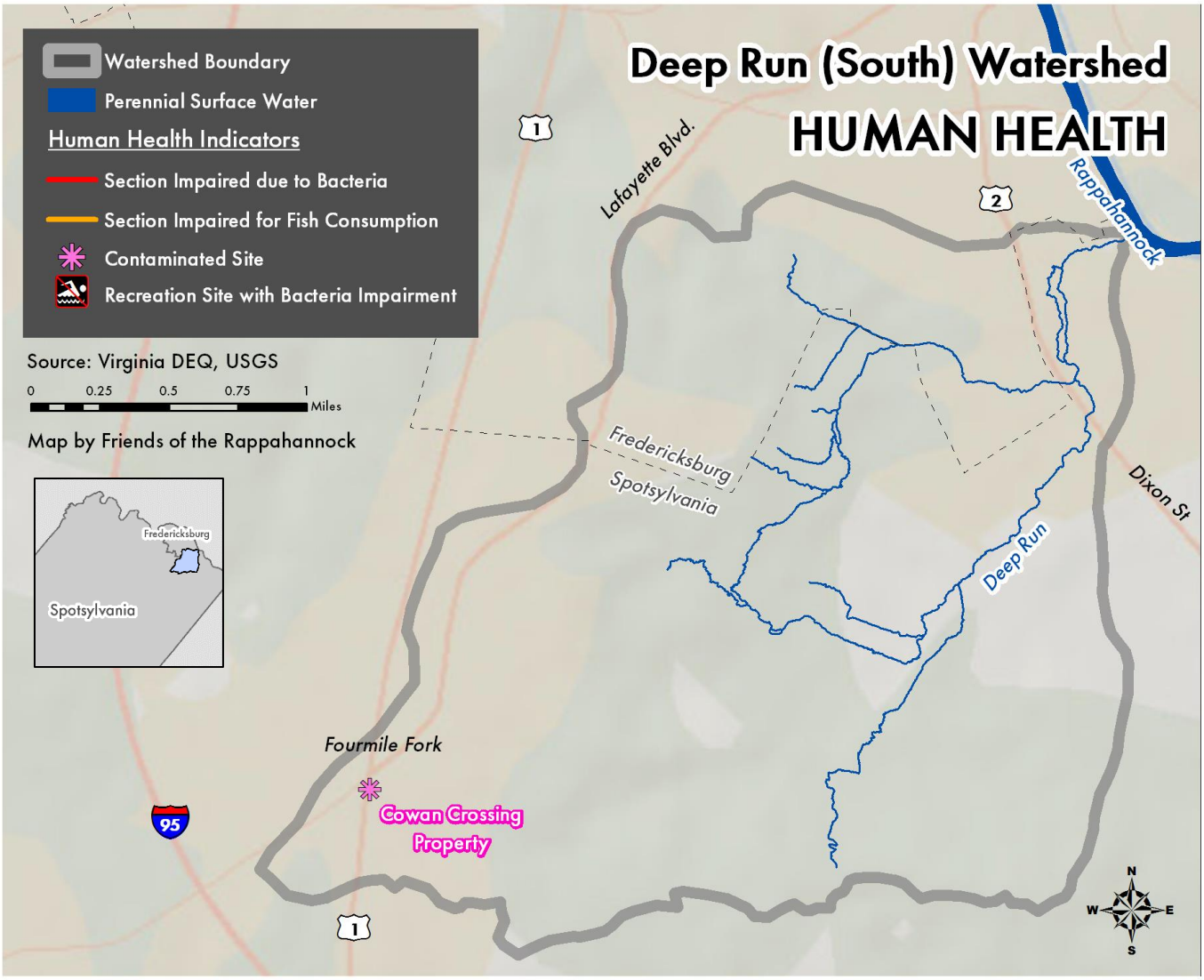
*Using state cost shares

Deep Run (South)

HUMAN HEALTH: B

Bacteria	Fish Consumption	Contaminated Sites	Recreational Health Risk
A	A	Fail	Pass
0% of stream-miles listed as impaired for recreation due to bacteria	0% of stream-miles listed as impaired for contaminated fish tissue	1 Brownfield site at Cowan Crossing Property	No recreation sites listed as impaired for recreation

For more information on indicators and grading scales, see Appendix 1

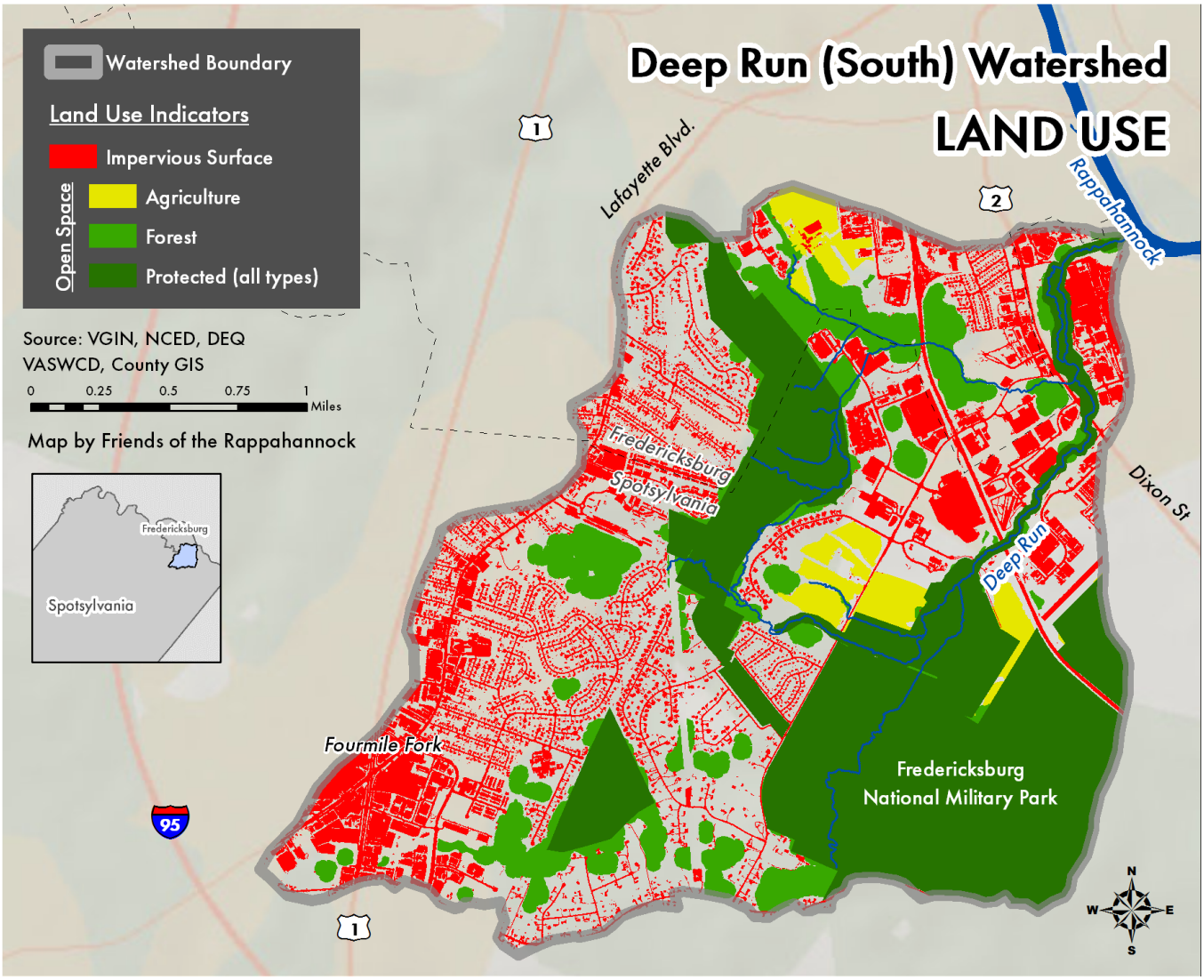


Deep Run (South)

LAND USE: C

D	A	A	F
Forest-Impervious Ratio	Open Space Protection	Agricultural BMPs	Residential BMPs
2.3 to 1 forest to impervious surface ratio	64.1% of open spaces under protection	47.4% of farmland treated by year, average 2007-2017	No residential BMPs installed in past 3 years using state cost share

For more information on indicators and grading scales, see Appendix 1

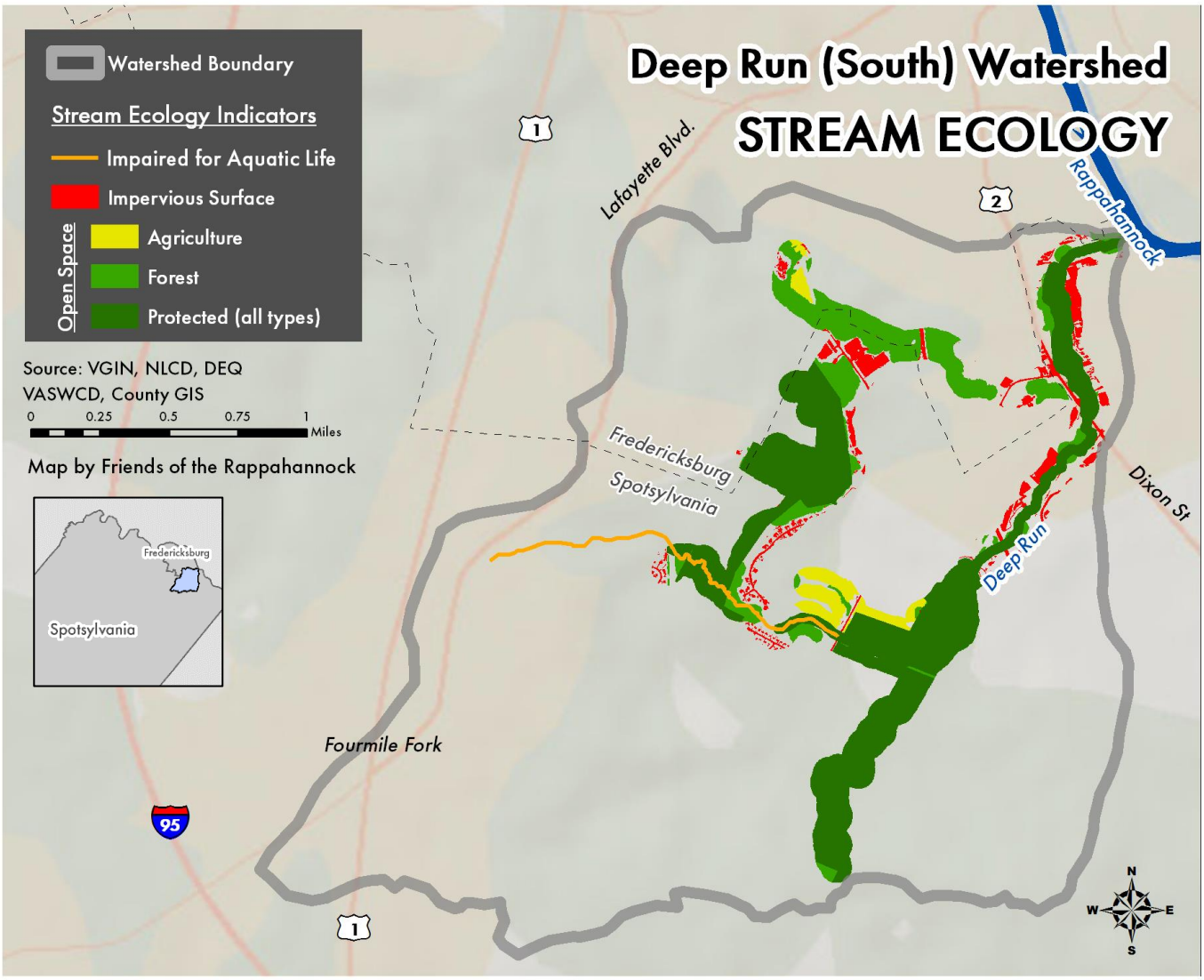


Deep Run (South)

STREAM ECOLOGY: C-

D	C	D	B
Aquatic Life	Impervious Surfaces	Forest Canopy	Open Space Protection
10.3% of stream-miles listed as impaired for aquatic life	9.6% of land within 300 feet of perennial streams are impervious	66% of land within 300 feet of perennial streams are forested	79.5% of open spaces within 300 feet of perennial streams under protection

For more information on indicators and grading scales, see Appendix 1

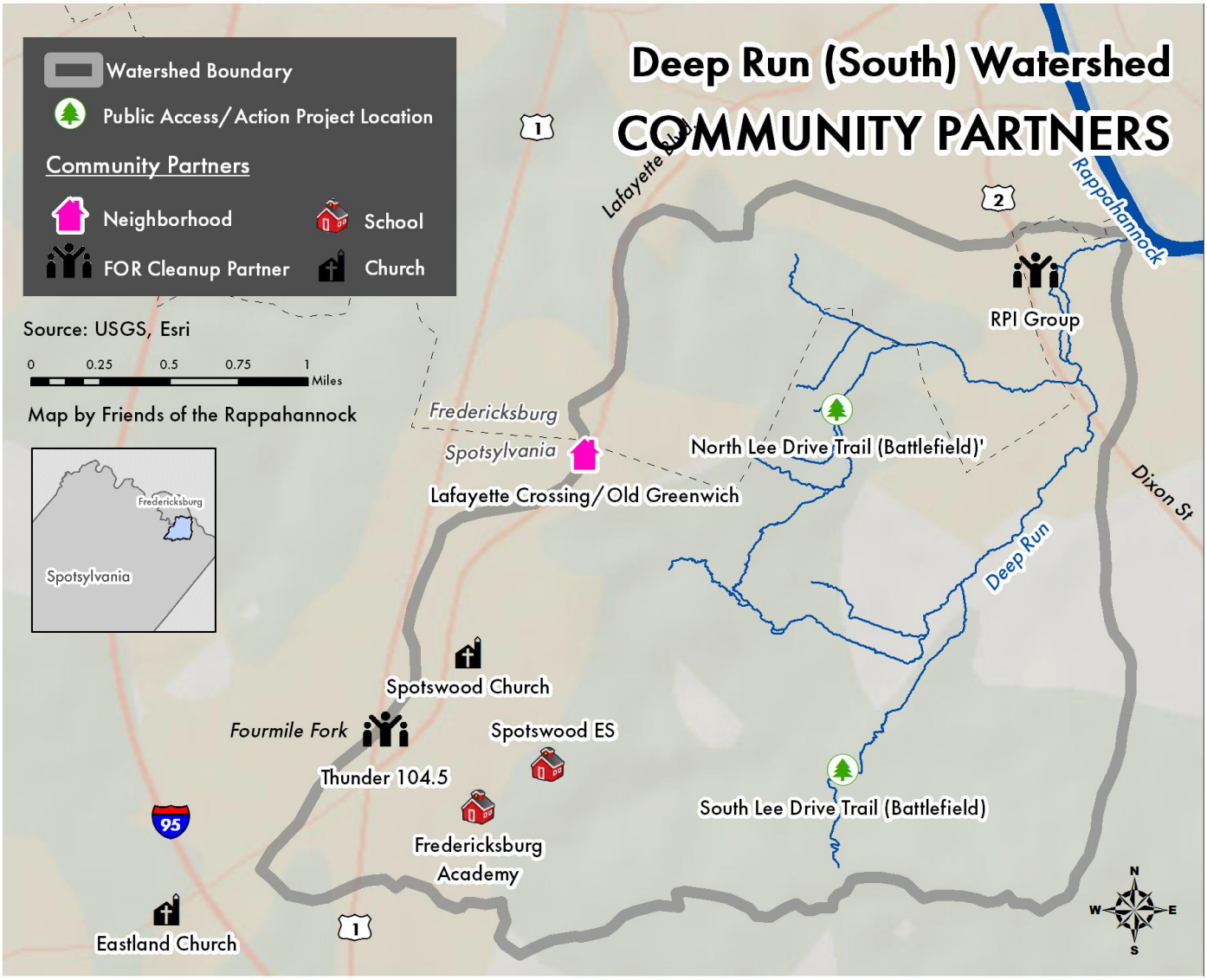


Deep Run (South)

COMMUNITY ENGAGEMENT: D+

Pass	F	C	F
Public Access	Watershed Education	River Cleanups	Road Crossing Signage
Public access via Lee Drive Trail	0% of K-8 public school students attended FOR field trip in last 2 school years	0.5 FOR river cleanups per 10,000 population per year, 2015-2017	0% (0 of 2) stream/road crossings marked with stream name

For more information on indicators and grading scales, see Appendix 1



Massaponax Creek Report Card

C-

Subject	Grade	Comments
Human Health	C	• 17% of stream-miles have unsafe bacteria count • No Recreational Health Risk sites in this watershed
Land Use	D+	• 3.1:1 forest-impervious ratio • 20% of the land use is in a protected area
Stream Ecology	C-	• 47% of stream-miles within 300 ft buffer from the stream have forested canopy cover • 60% of 300 foot buffers around perennial streams protected
Community Engagement	C	• 6% of road crossings marked • 30% of K-8 public school students from this watershed attended FOR field trip in last 2 school years

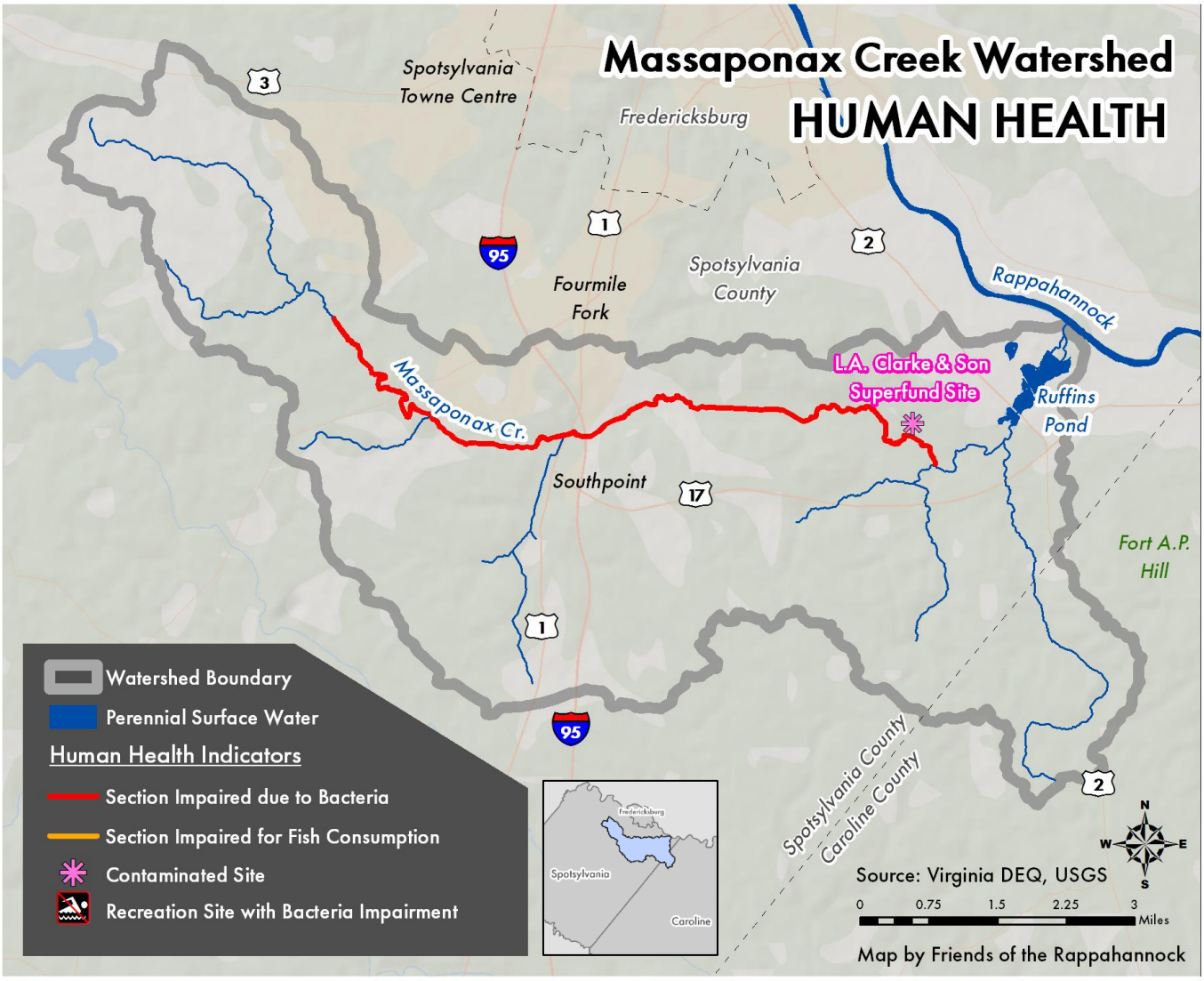
*Using state cost shares

Massaponax Creek

HUMAN HEALTH: C

D	A	Fail	Pass
Bacteria	Fish Consumption	Contaminated Sites	Recreational Health Risk
16.8% of stream-miles listed as impaired for recreation due to bacteria	0% of stream-miles listed as impaired for contaminated fish tissue	1 Superfund site at L.A. Clarke & Son site	No impairment

For more information on indicators and grading scales, see Appendix 1

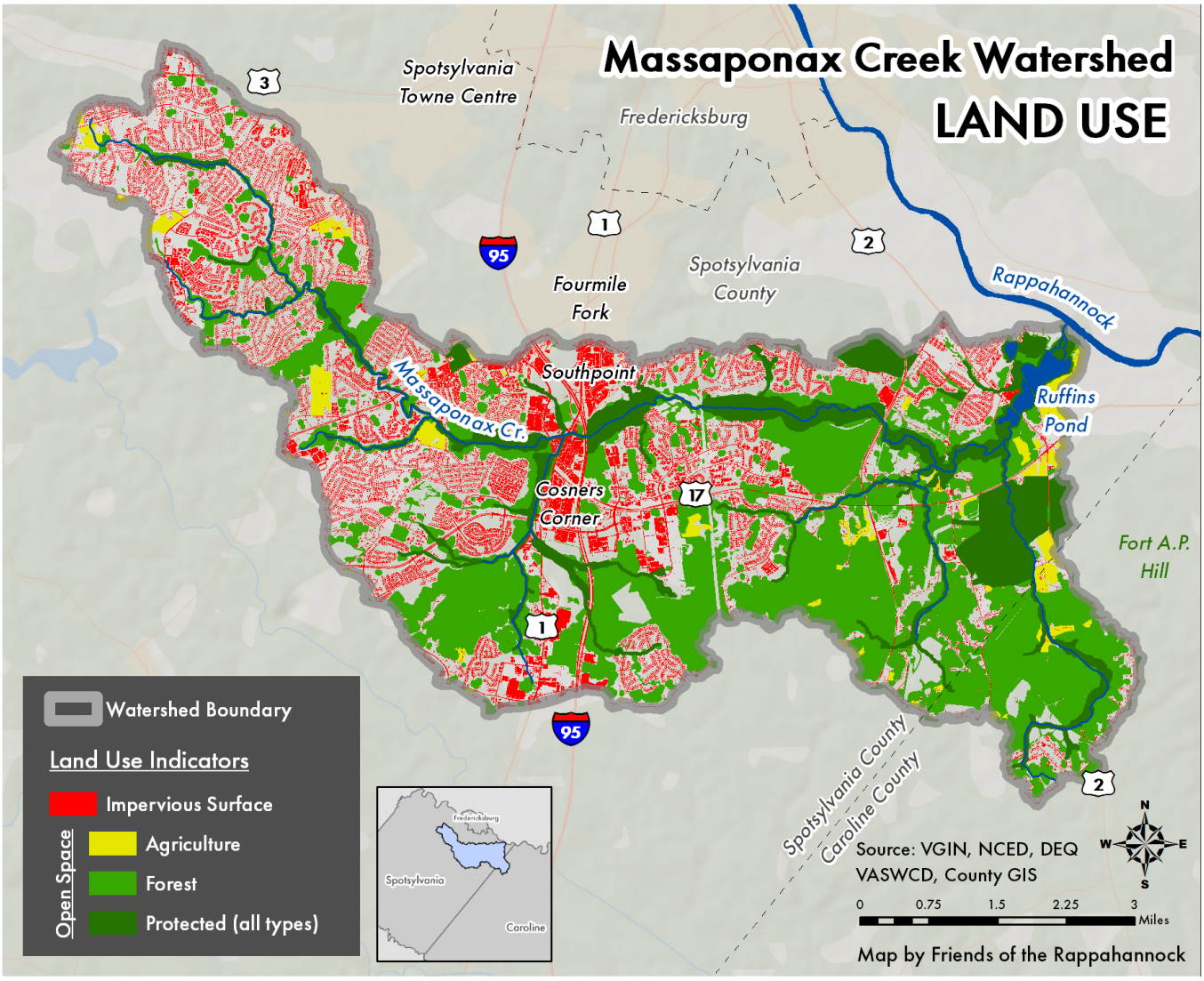


Massaponax Creek

LAND USE D+

D	B	C	F
Forest-Impervious Ratio	Open Space Protection	Agricultural BMPs	Residential BMPs
3.1 to 1 forest to impervious surface ratio	20.2% of open spaces under protection	14.8% of farmland treated by year, average 2007-2017	0 residential BMPs installed in past 3 years using state cost share

For more information on indicators and grading scales, see Appendix 1

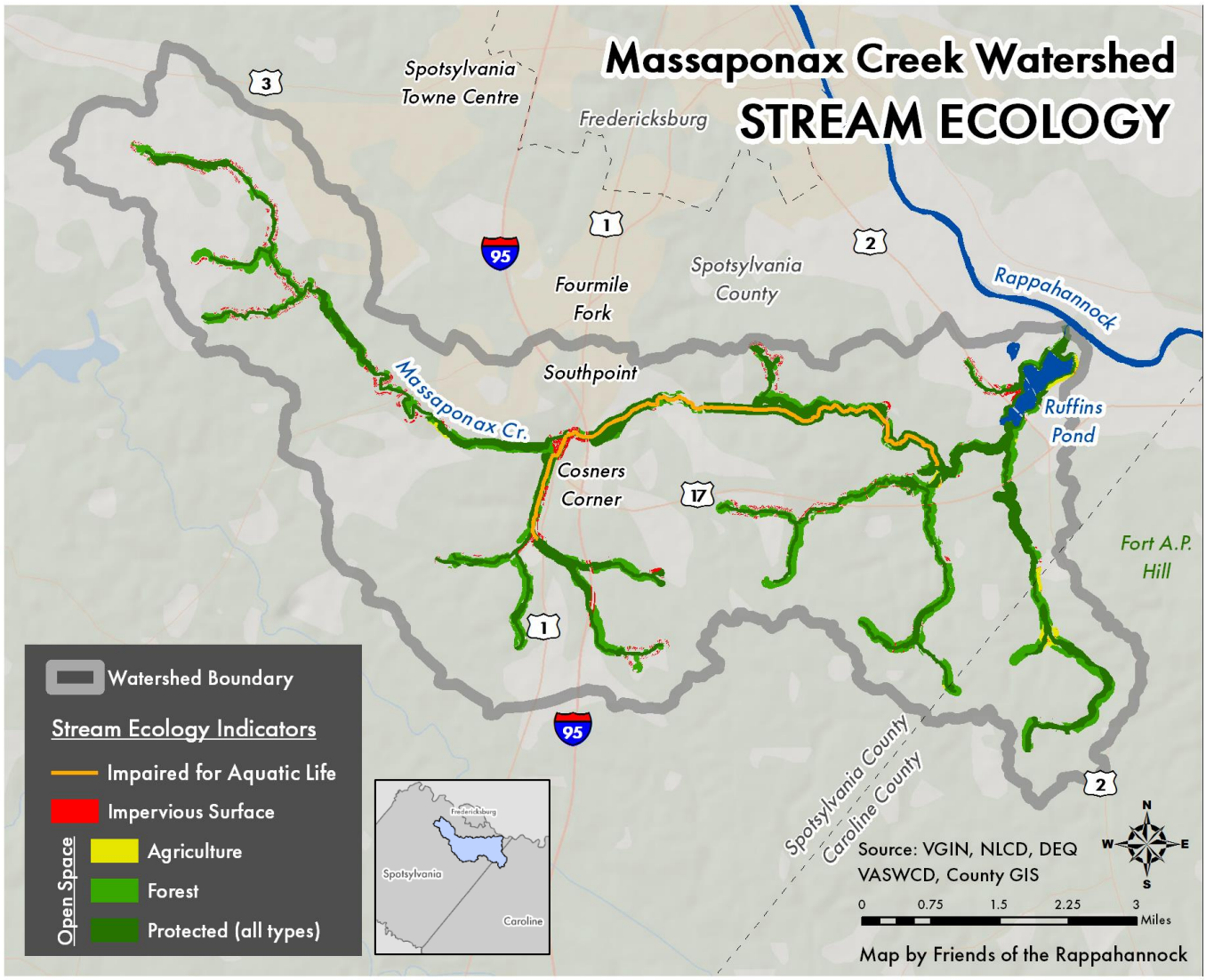


Massaponax Creek

STREAM ECOLOGY C-

Aquatic Life	Impervious Surfaces	Forest Canopy	Open Space Protection
C	C	F	B
9.64% of stream-miles listed as impaired for aquatic life	5.6% of land within 300 feet of perennial streams are impervious	47.1% of land within 300 feet of perennial streams are forested	60.4% of open spaces within 300 feet of perennial streams under protection

For more information on indicators and grading scales, see Appendix 1

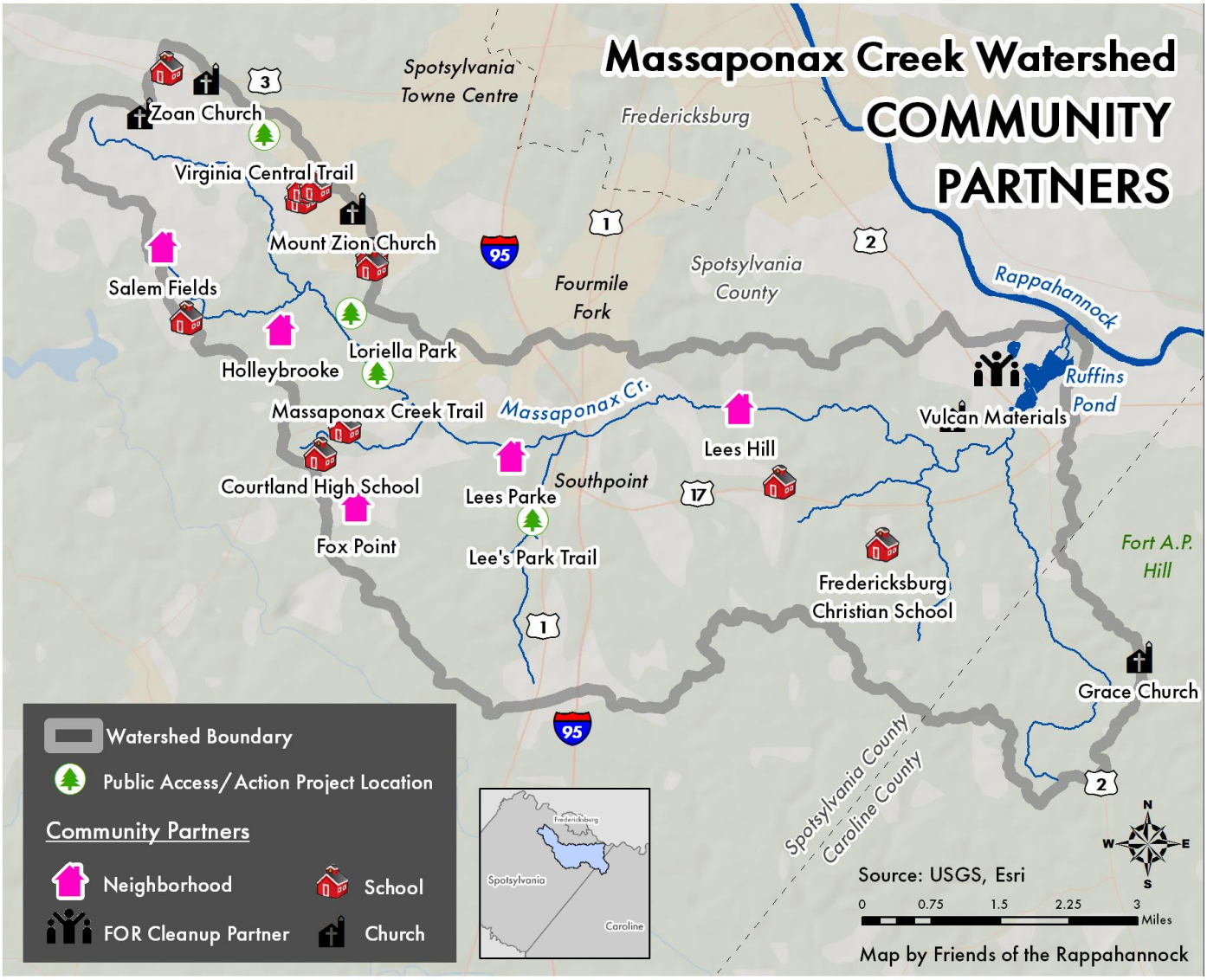


Massaponax Creek

COMMUNITY ENGAGEMENT: C

Pass	B	D	F
Public Access	**Watershed Education**	**River Cleanups**	**Road Crossing Signage**
No public access points	29.9% of K-8 public school students attended FOR field trip in last 2 school years	0.1 river cleanups per 10,000 population per year, 2015-2017	6.3% (1 of 16) stream/road crossings marked with stream name

For more information on indicators and grading scales, see Appendix 1



Stafford County Results

Claiborne Run Report Card

C

Subject	Grade	Comments
Human Health	C+	• 10% of stream-miles have unsafe bacteria count • 25% of stream-miles have unsafe PCB levels in fish tissue
Land Use	C	• 1.9:1 forest-impervious ratio • No residential BMPs installed in past 3 years*
Stream Ecology	D+	• 17% of watershed is impervious surface • Only 57% of land near streams forested
Community Engagement	C	• No public access • 0.3 FOR river cleanups per 10,000 pop. per year in past 3 years

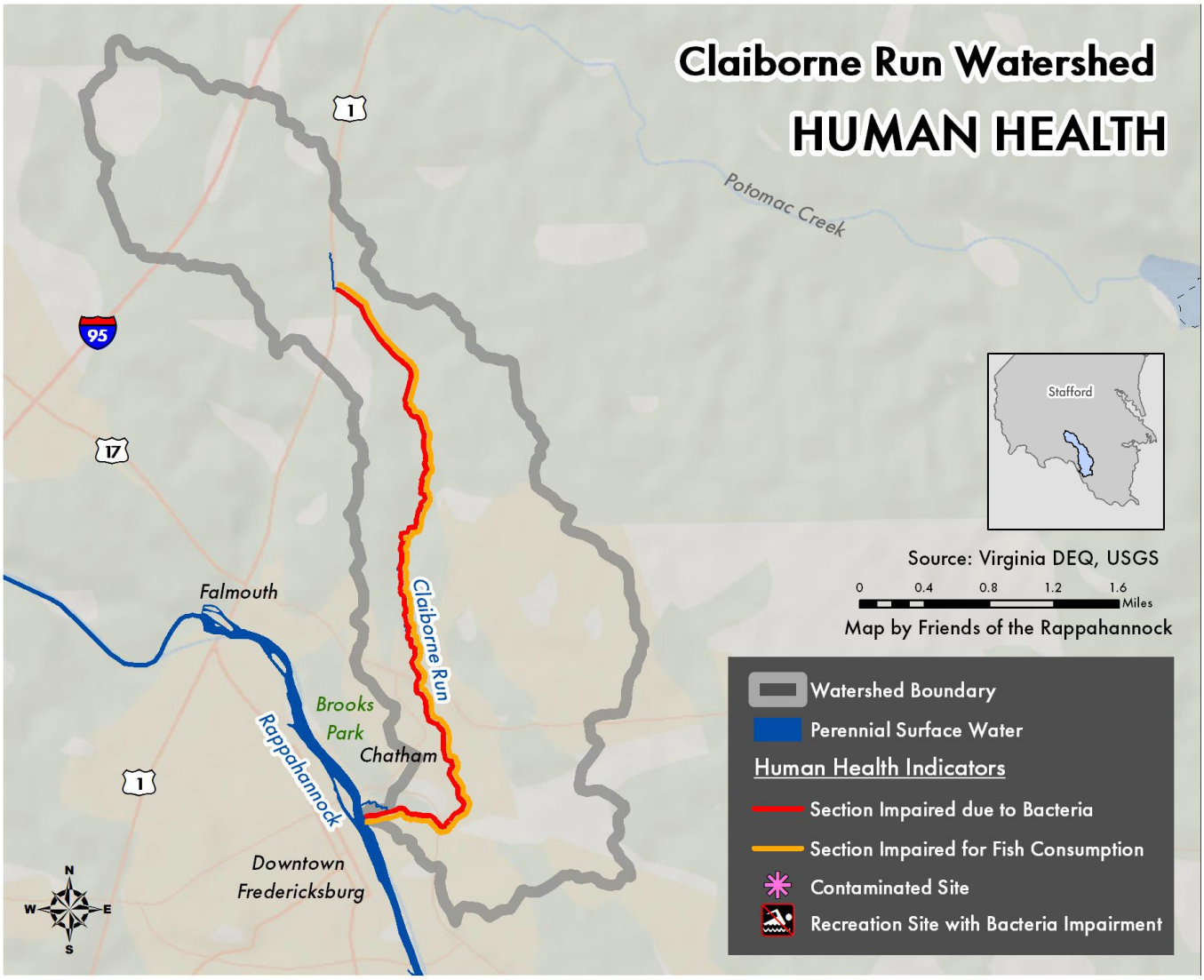
*Using state cost shares

Claiborne Run

HUMAN HEALTH: B-

C	F	Pass	Pass
Bacteria	Fish Consumption	Contaminated Sites	Recreational Health Risk
9.8% of stream-miles listed as impaired for recreation due to bacteria	25.1% of stream-miles listed as impaired for contaminated fish tissue	No contaminated sites	No recreation sites listed as impaired for recreation

For more information on indicators and grading scales, see Appendix 1

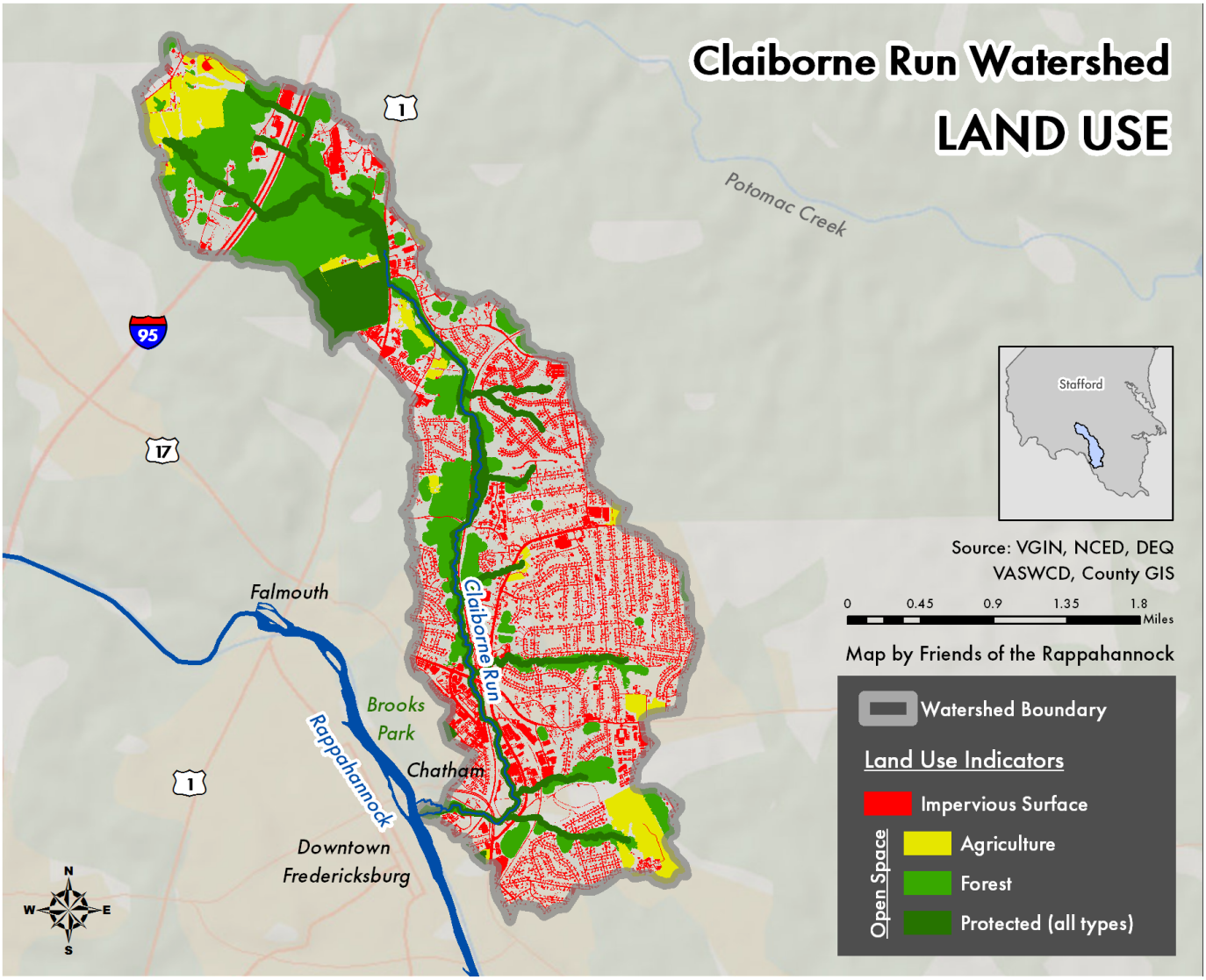


Claiborne Run

LAND USE: D+

F	A	A	F
Forest-Impervious Ratio	Open Space Protection	Agricultural BMPs	Residential BMPs
1.9 to 1 forest to impervious surface ratio	34.4% of open spaces under protection	34.4% of farmland treated by year, average 2007-2017	No residential BMPs installed in past 3 years using state cost share

For more information on indicators and grading scales, see Appendix 1

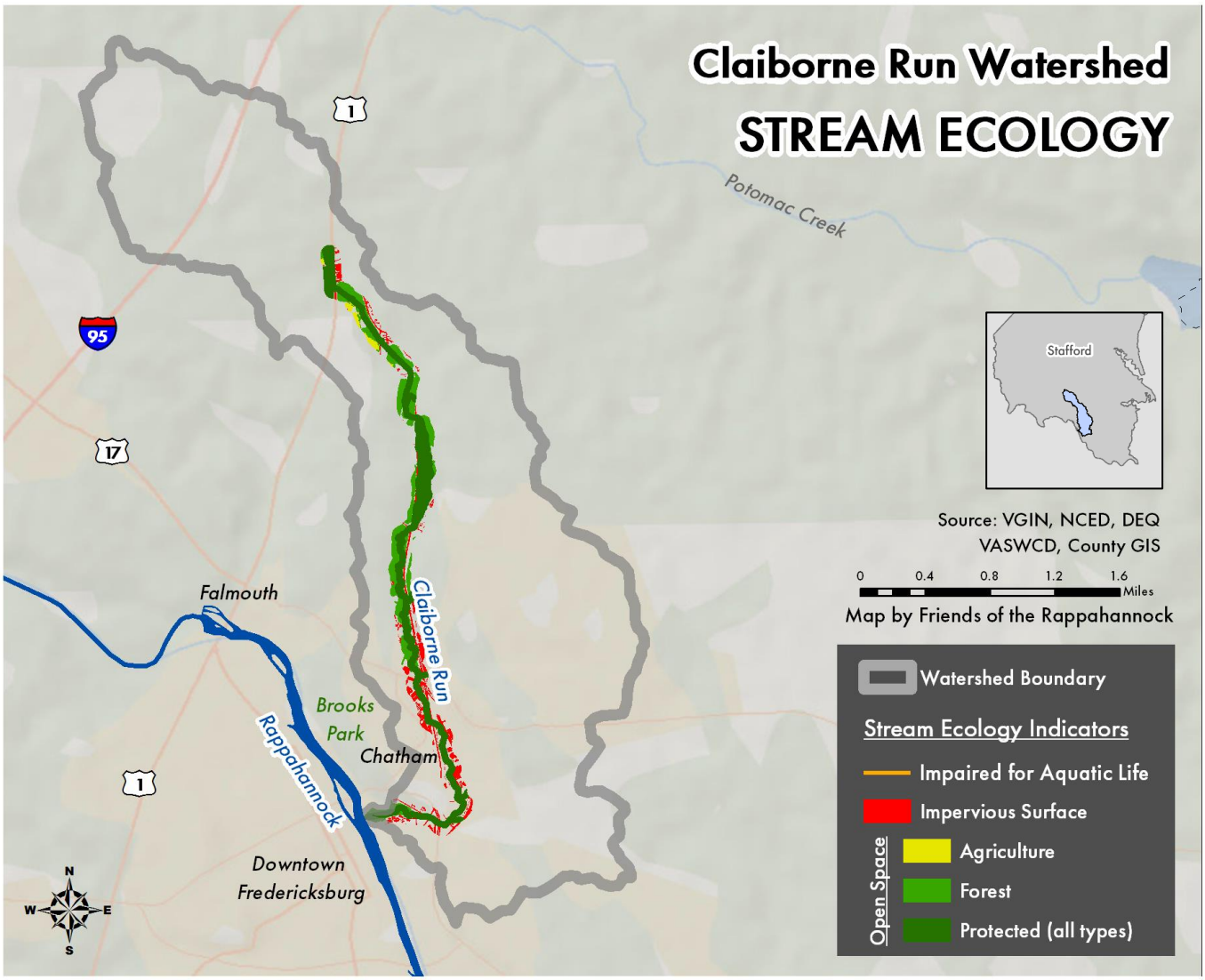


Claiborne Run

STREAM ECOLOGY: D+

A	F	F	C
Aquatic Life	Impervious Surfaces	Forest Canopy	Open Space Protection
0% of stream-miles listed as impaired for aquatic life	17.4% of land within 300 feet of perennial streams are impervious	57.3% of land within 300 feet of perennial streams are forested	59.3% of open spaces within 300 feet of perennial streams under protection

For more information on indicators and grading scales, see Appendix 1



Claiborne Run

COMMUNITY ENGAGEMENT: C

Public Access	Watershed Education	River Cleanups	Road Crossing Signage
Fail	A	C	C
No public access via trail or park	56.2% of K-8 public school students attended FOR field trip in last 2 school years	0.3 FOR river cleanups per 10,000 population per year, 2015-2017	33.3% (3 of 9) stream/road crossings marked with stream name

For more information on indicators and grading scales, see Appendix 1

Deep Run (North) Report Card

C+

Subject	Grade	Comments
Human Health	B+	• 8% of stream-miles have unsafe bacteria count • No contaminated sites or recreational health risk advisories
Land Use	D+	• 27.9:1 forest-impervious ratio • No residential BMPs installed in past 3 years*
Stream Ecology	B	• 0% of stream-miles have degraded aquatic life • 25% of open land is protected within a 300 foot buffer around the stream
Community Engagement	C+	• No public access points • 50% of stream crossings have been marked

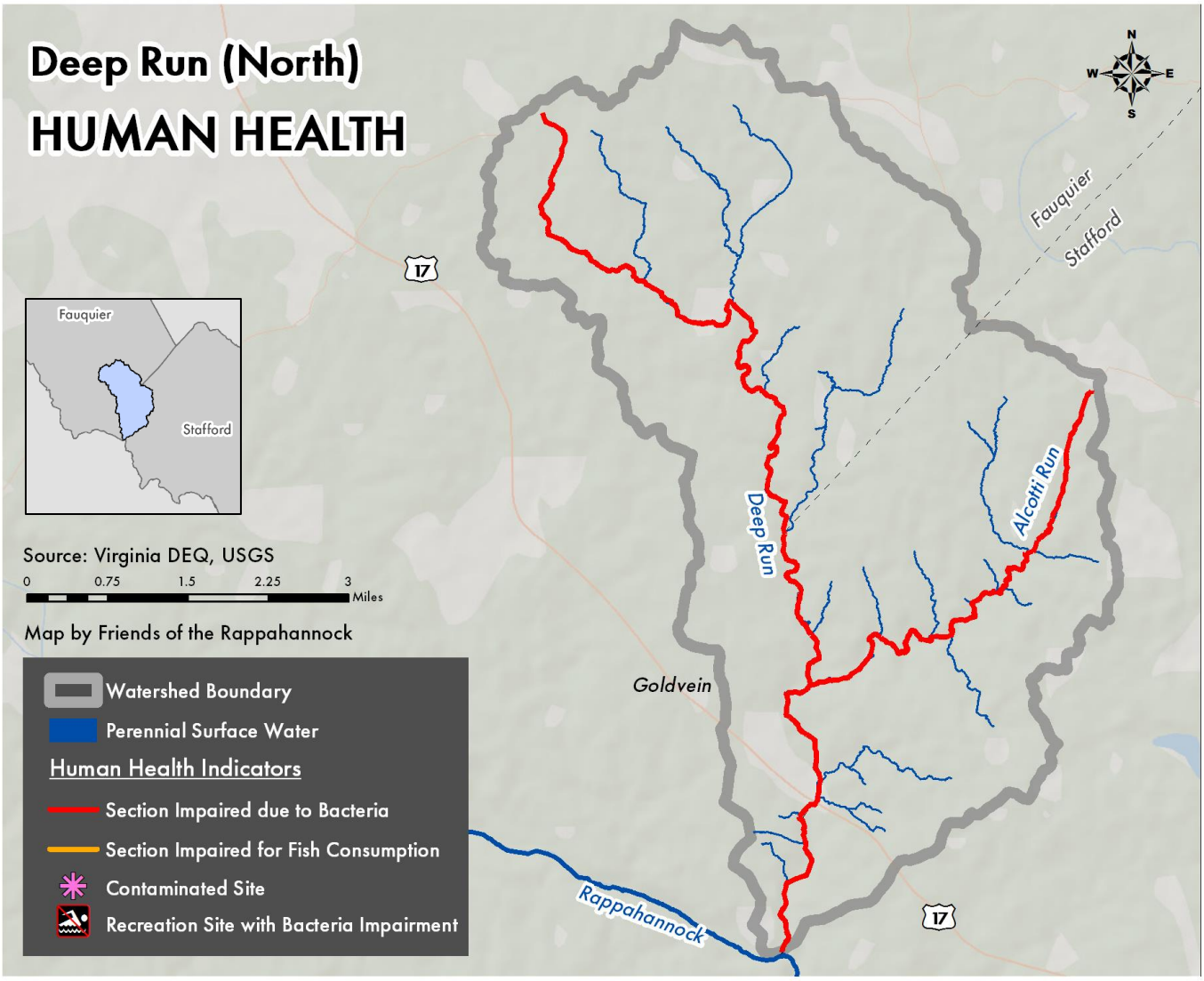
*Using state cost shares

Deep Run (North)

HUMAN HEALTH: B+

Bacteria	Fish Consumption	Contaminated Sites	Recreational Health Risk
C	A	Pass	Pass
8.2% of stream-miles listed as impaired for recreation due to bacteria	0% of stream-miles listed as impaired for contaminated fish tissue	No contaminated sites	No recreation sites listed as impaired for recreation

For more information on indicators and grading scales, see Appendix 1

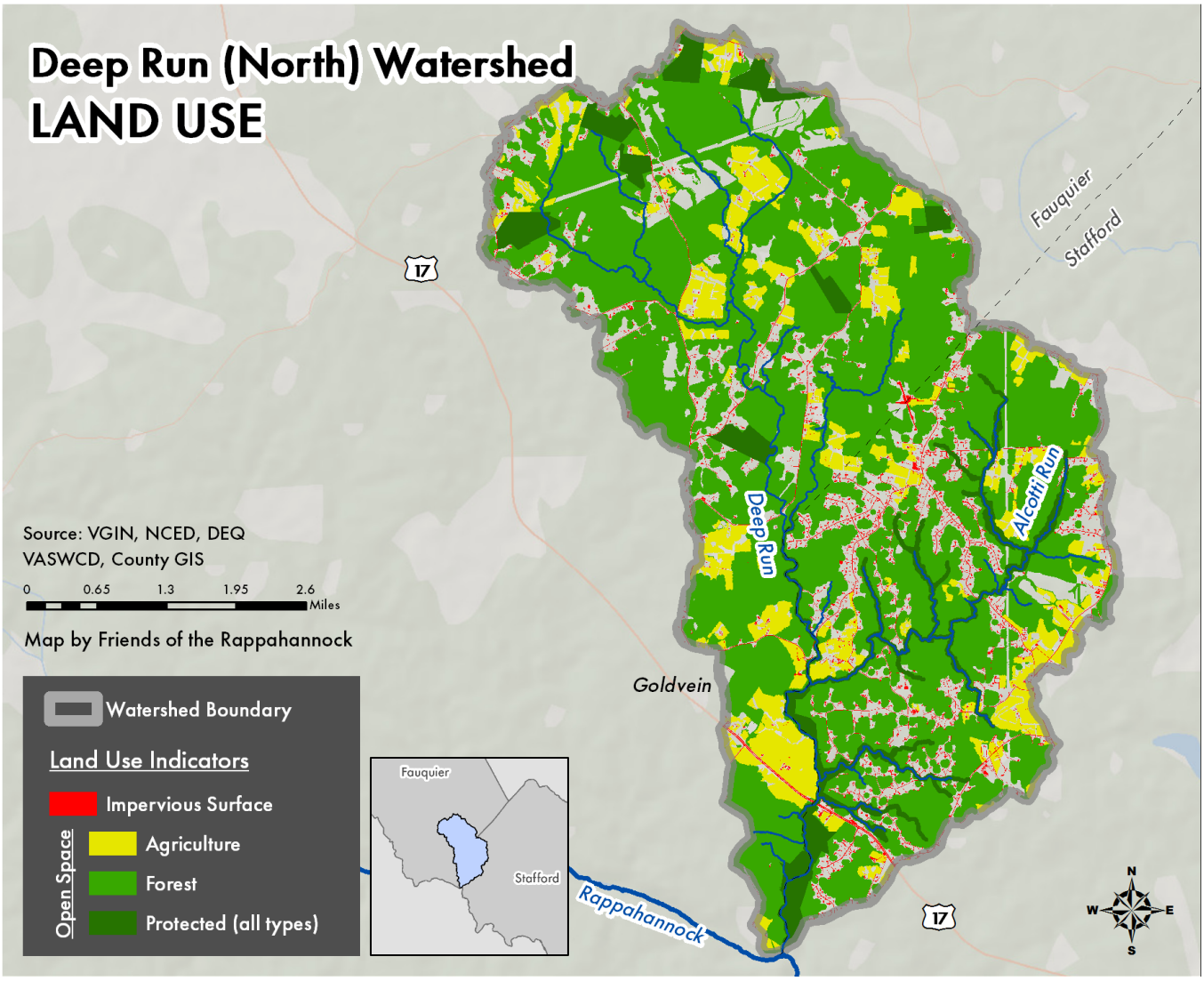


Deep Run (North)

LAND USE: D+

A	F	D	F
Forest-Impervious Ratio	Open Space Protection	Agricultural BMPs	Residential BMPs
27.9:1 forest to impervious surface ratio	8.4% of open spaces under protection	3.9% of farmland treated by year, average 2007-2017	No residential BMPs installed in past 3 years using state cost share

For more information on indicators and grading scales, see Appendix 1

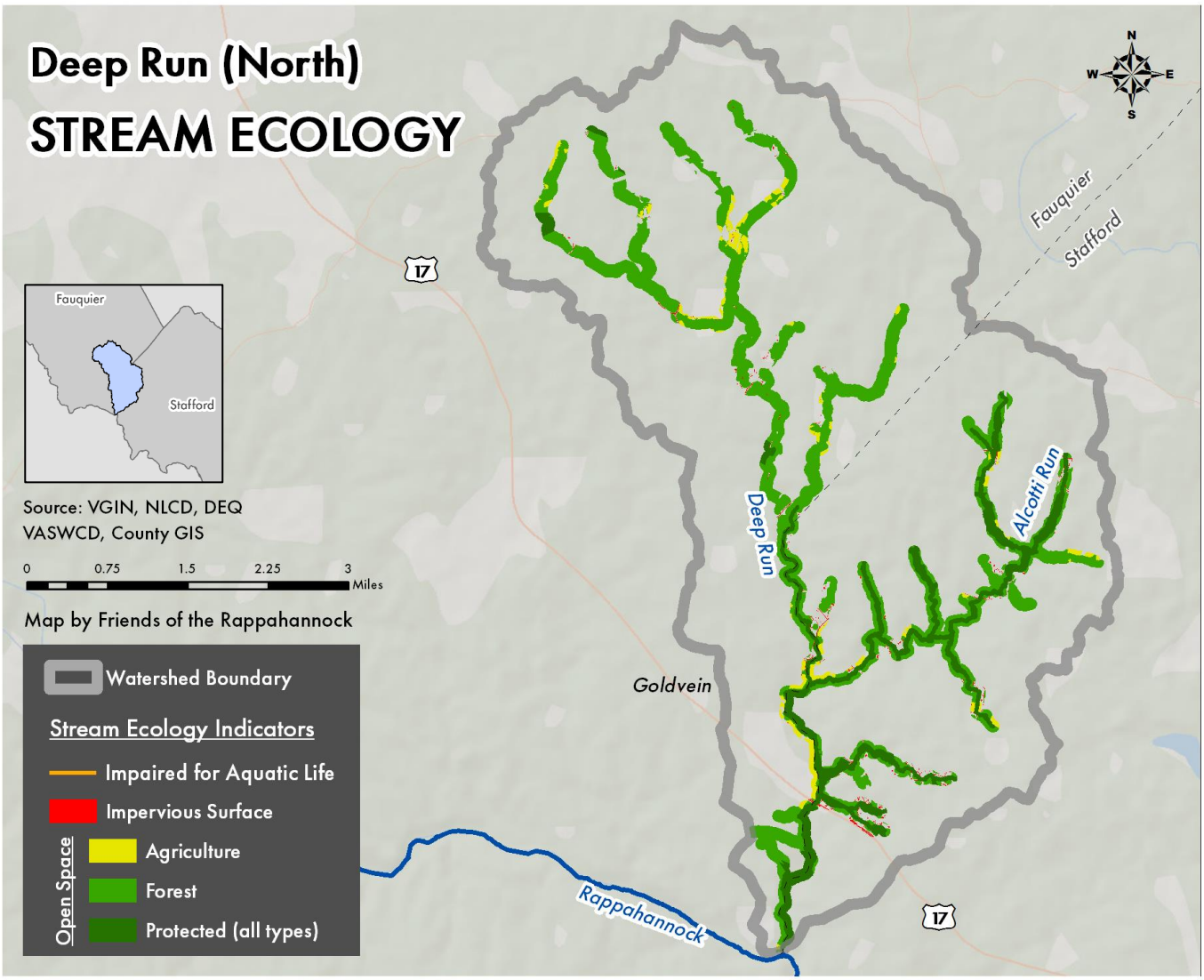


Deep Run (North)

STREAM ECOLOGY: B

A	A	B	D
Aquatic Life	Impervious Surfaces	Forest Canopy	Open Space Protection
0% of stream-miles listed as impaired for aquatic life	1.2% of land within 300 feet of perennial streams are impervious	88.5% of land within 300 feet of perennial streams are forested	24.9% of open spaces within 300 feet of perennial streams under protection

For more information on indicators and grading scales, see Appendix 1

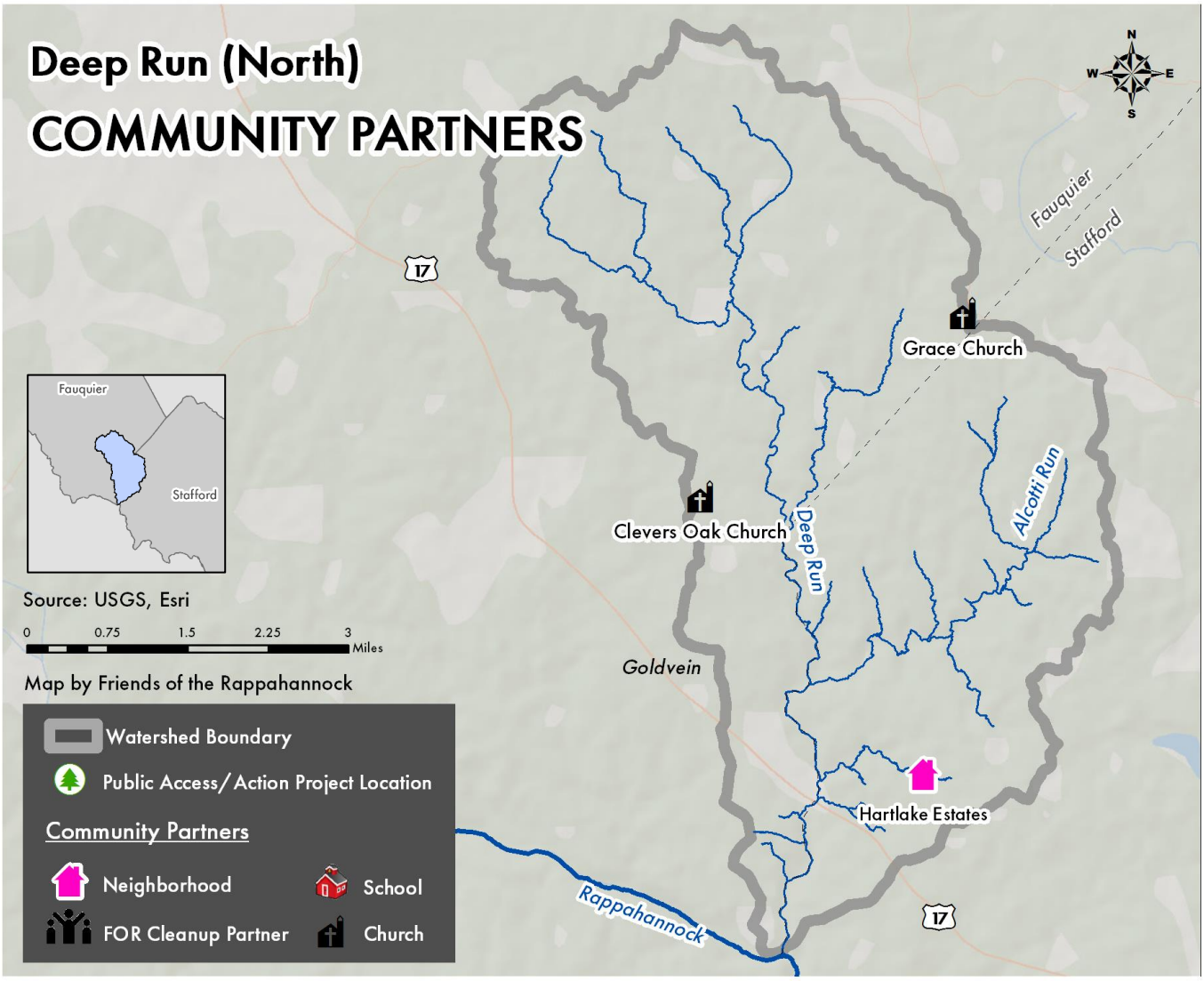


Deep Run (North)

COMMUNITY ENGAGEMENT: C

Public Access	Watershed Education	River Cleanups	Road Crossing Signage
None	N/A	N/A	A
No public access to streams	No schools in watershed	No public access sites	50% (1 of 2) stream/road crossings marked with stream name

For more information on indicators and grading scales, see Appendix 1



England Run Report Card

B-

Subject	Grade	Comments
Human Health	A	• 0% of stream-miles have unsafe bacteria count • No known contaminated sites
Land Use	D+	• 2.2:1 forest-impervious ratio • No residential BMPs installed in past 3 years*
Stream Ecology	B	• 0% of stream-miles have degraded aquatic life • 82% of watershed is impervious surface
Community Engagement	B-	• 0% of road crossings marked • 16.7 FOR river cleanups per 10,000 population per year in past 3 years

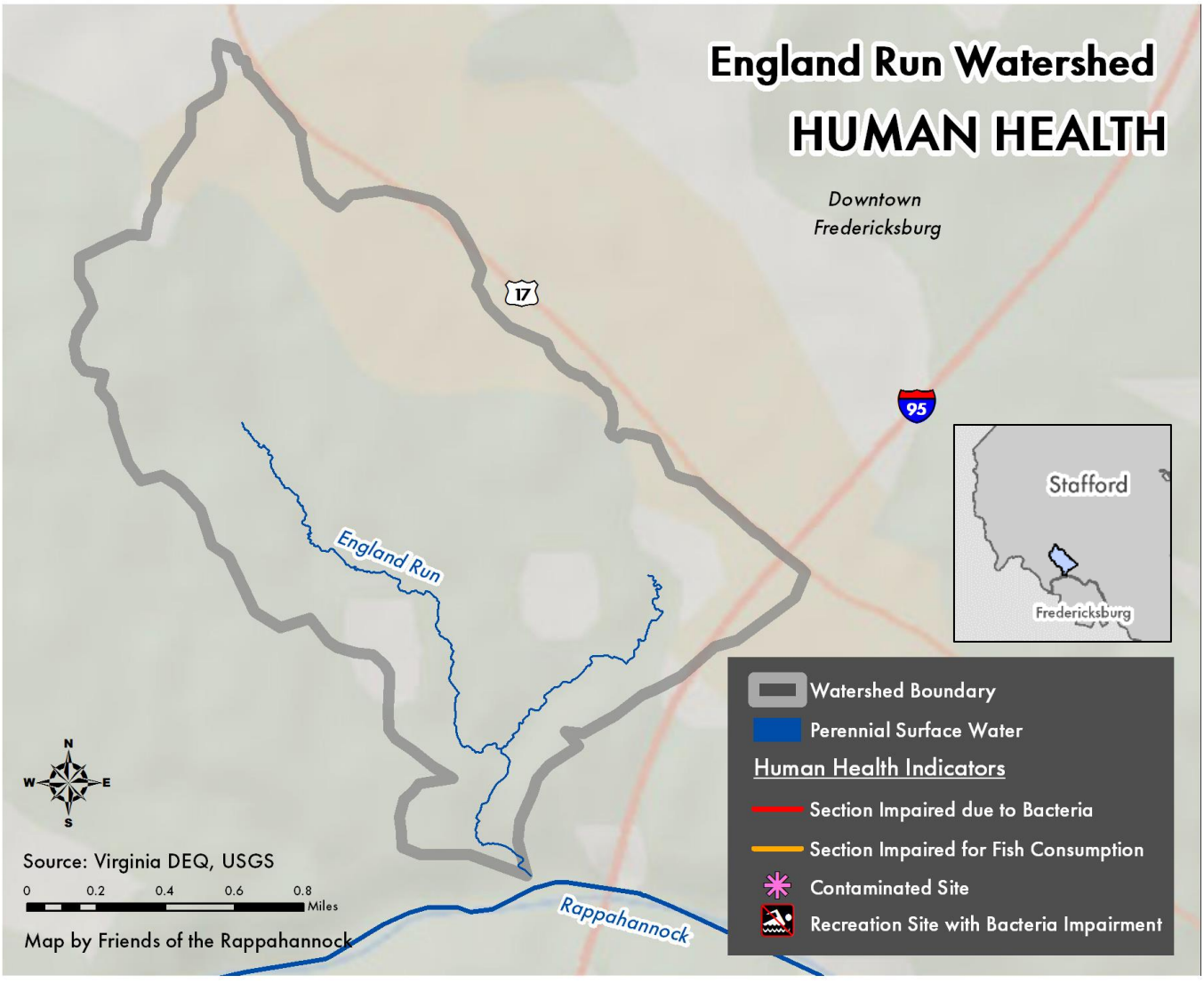
*Using state cost shares

England Run

HUMAN HEALTH: A

Bacteria	Fish Consumption	Contaminated Sites	Recreational Health Risk
A	A	Pass	Pass
0% of stream-miles listed as impaired for recreation due to bacteria	0% of stream-miles listed as impaired for contaminated fish tissue	No contaminated sites	No recreation sites listed as impaired for recreation

For more information on indicators and grading scales, see Appendix 1

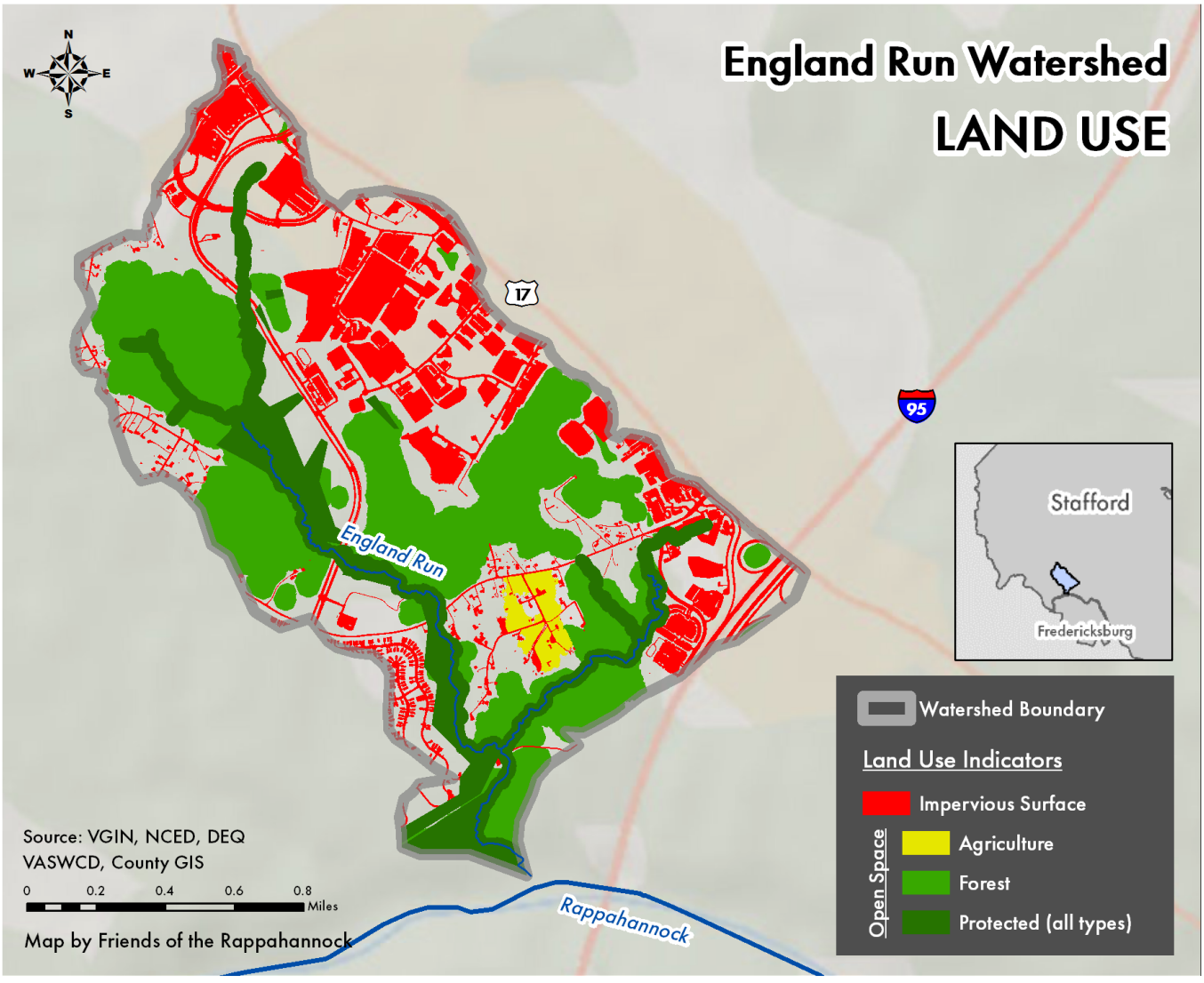


England Run

LAND USE: D+

D	B	N/A	F
Forest-Impervious Ratio	Open Space Protection	Agricultural BMPs	Residential BMPs
2.2 to 1 forest to impervious surface ratio	21.3% of open spaces under protection	Less than 3% of land used for agriculture	No residential BMPs installed in past 3 years using state cost share

For more information on indicators and grading scales, see Appendix 1

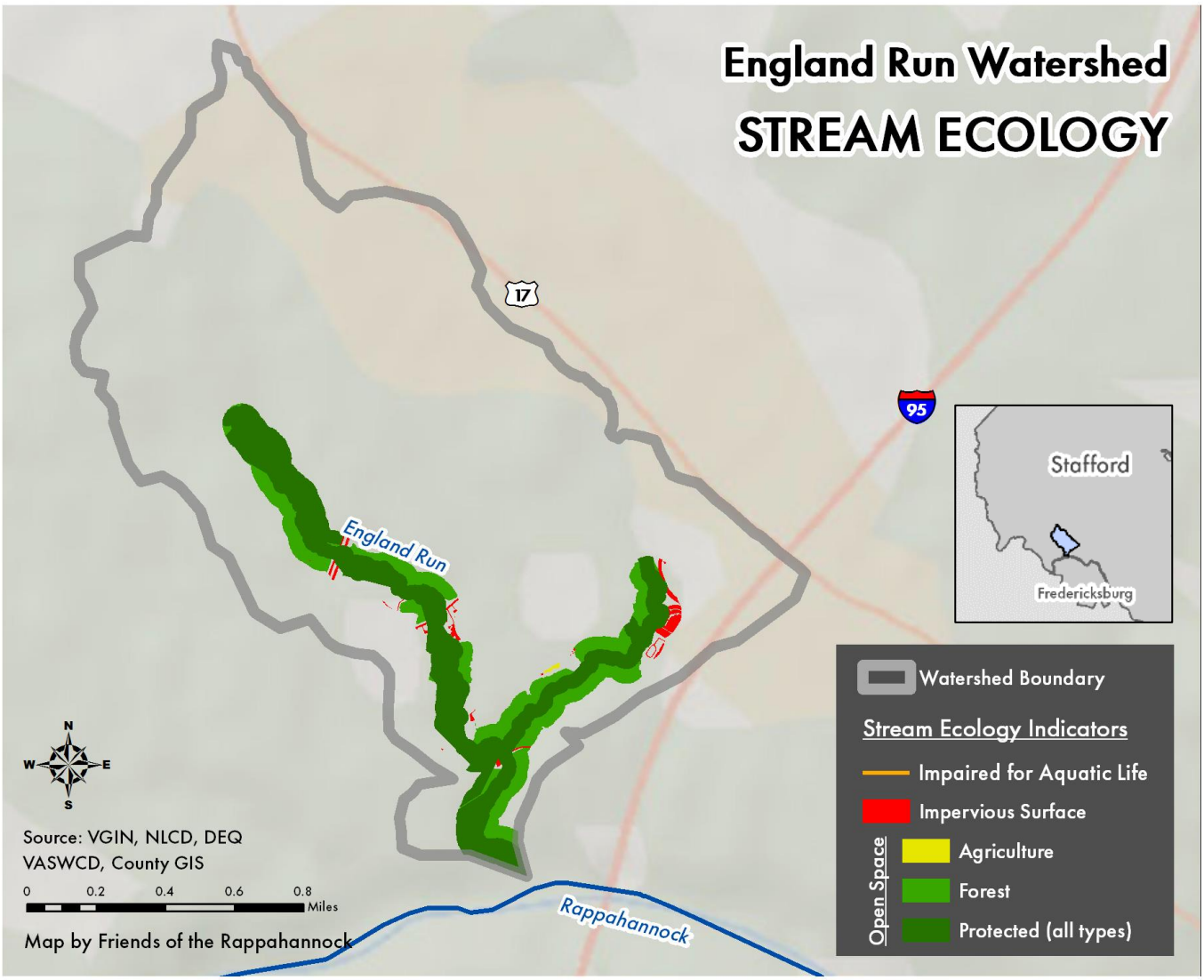


England Run

STREAM ECOLOGY: B

A	B	B	B
Aquatic Life	Impervious Surfaces	Forest Canopy	Open Space Protection
0% of stream-miles listed as impaired for aquatic life	4.3% of land within 300 feet of perennial streams are impervious	81.4% of land within 300 feet of perennial streams are forested	61.4% of open spaces within 300 feet of perennial streams under protection

For more information on indicators and grading scales, see Appendix 1



England Run

COMMUNITY ENGAGEMENT: B-

Public Access	Watershed Education	River Cleanups	Road Crossing Signage
Pass	N/A	A	F
Access via England Run Trail	No schools in watershed	16.7 FOR river cleanups per 10,000 population per year, 2015-2017	0% (0 of 3) stream/road crossings marked with stream name

For more information on indicators and grading scales, see Appendix 1

Falls Run Report Card

C-

Subject	Grade	Comments
Human Health	A	• 0% of stream-miles have unsafe bacteria count • No known contaminated sites
Land Use	F	• 1.6:1 forest-impervious ratio • No residential BMPs installed in past 3 years*
Stream Ecology	C	• 44% of stream-miles have degraded aquatic life • 0.9% of watershed is impervious surface
Community Engagement	D	• 33% of road crossings marked • 0.3 FOR river cleanup per 10,000 pop. per year during past 3 years

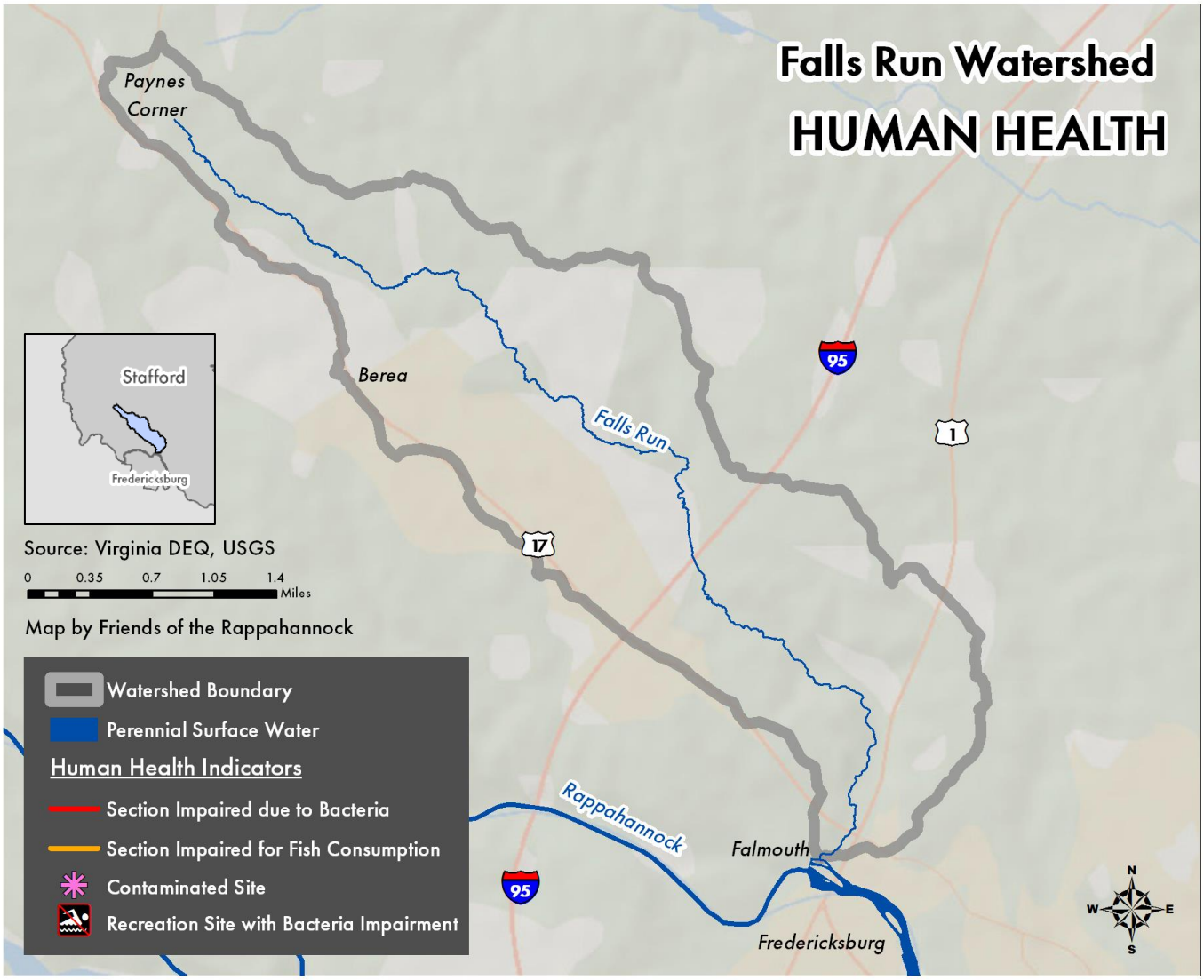
*Using state cost shares

Falls Run

HUMAN HEALTH: A

Bacteria	Fish Consumption	Contaminated Sites	Recreational Health Risk
A	A	Pass	Pass
0% of stream-miles listed as impaired for recreation due to bacteria	0% of stream-miles listed as impaired for contaminated fish tissue	No contaminated sites	No recreation sites listed as impaired for recreation

For more information on indicators and grading scales, see Appendix 1

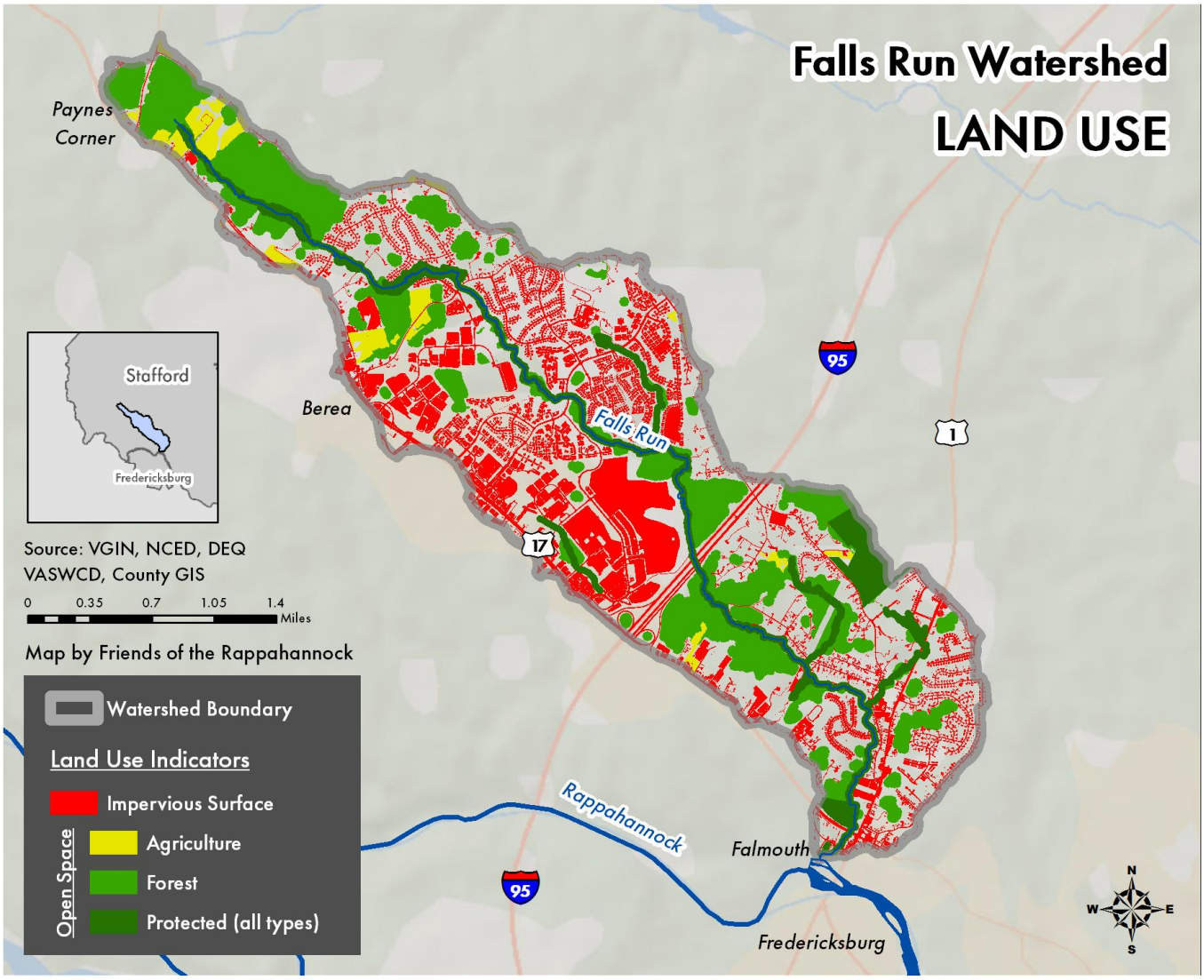


LAND USE: D

Falls Run

F	C	F	F
Forest-Impervious Ratio	Open Space Protection	Agricultural BMPs	Residential BMPs
1.6 to 1 forest to impervious surface ratio	18.2% of open spaces under protection	No agricultural BMPs using state cost share 2007-2017	No residential BMPs installed in past 3 years using state cost share

For more information on indicators and grading scales, see Appendix 1

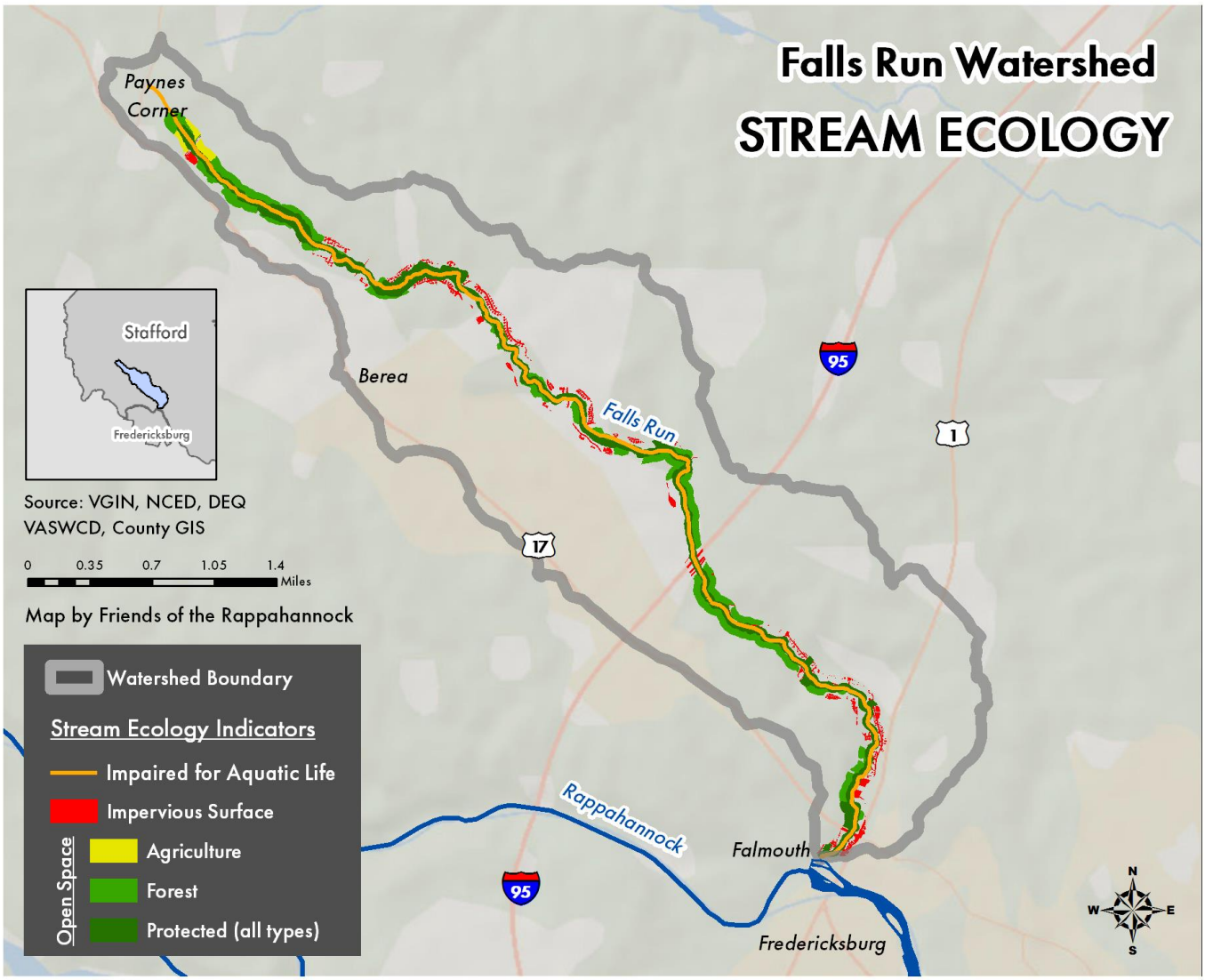


Falls Run

STREAM ECOLOGY: C

F	A	C	C
Aquatic Life	Impervious Surfaces	Forest Canopy	Open Space Protection
43.9% of stream-miles listed as impaired for aquatic life	0.9% of land within 300 feet of perennial streams are impervious	76% of land within 300 feet of perennial streams are forested	42.5% of open spaces within 300 feet of perennial streams under protection

For more information on indicators and grading scales, see Appendix 1



COMMUNITY ENGAGEMENT: D

Falls Run

Public Access	Watershed Education	River Cleanups	Road Crossing Signage
Fail	F	C	C
No public access via park or trail	0% of K-8 public school students attended FOR field trip in last 2 school years	0.3 FOR river cleanups per 10,000 population per year, 2015-2017	33% (2 of 6) stream/road crossings marked with stream name

For more information on indicators and grading scales, see Appendix 1

Horse Pen Run Report Card

C+

Subject	Grade	Comments
Human Health	B+	• 6% of stream-miles have unsafe bacteria count • No Recreational Health Risk sites in this watershed
Land Use	C+	• 24.1:1 forest-impervious ratio
Stream Ecology	B+	• 0% of stream-miles have degraded aquatic life • 59% of 300 foot buffers around perennial streams protected
Community Engagement	F	• 0% of road crossings marked • 15% of K-8 public school students from this watershed attended FOR field trip in the past 2 years

*Using state cost shares

Horsepen Run

HUMAN HEALTH: B+

Bacteria	Fish Consumption	Contaminated Sites	Recreational Health Risk
C	A	Pass	Pass
6.1% of stream-miles listed as impaired for recreation due to bacteria	0% of stream-miles listed as impaired for contaminated fish tissue	No contaminated sites	No impairment

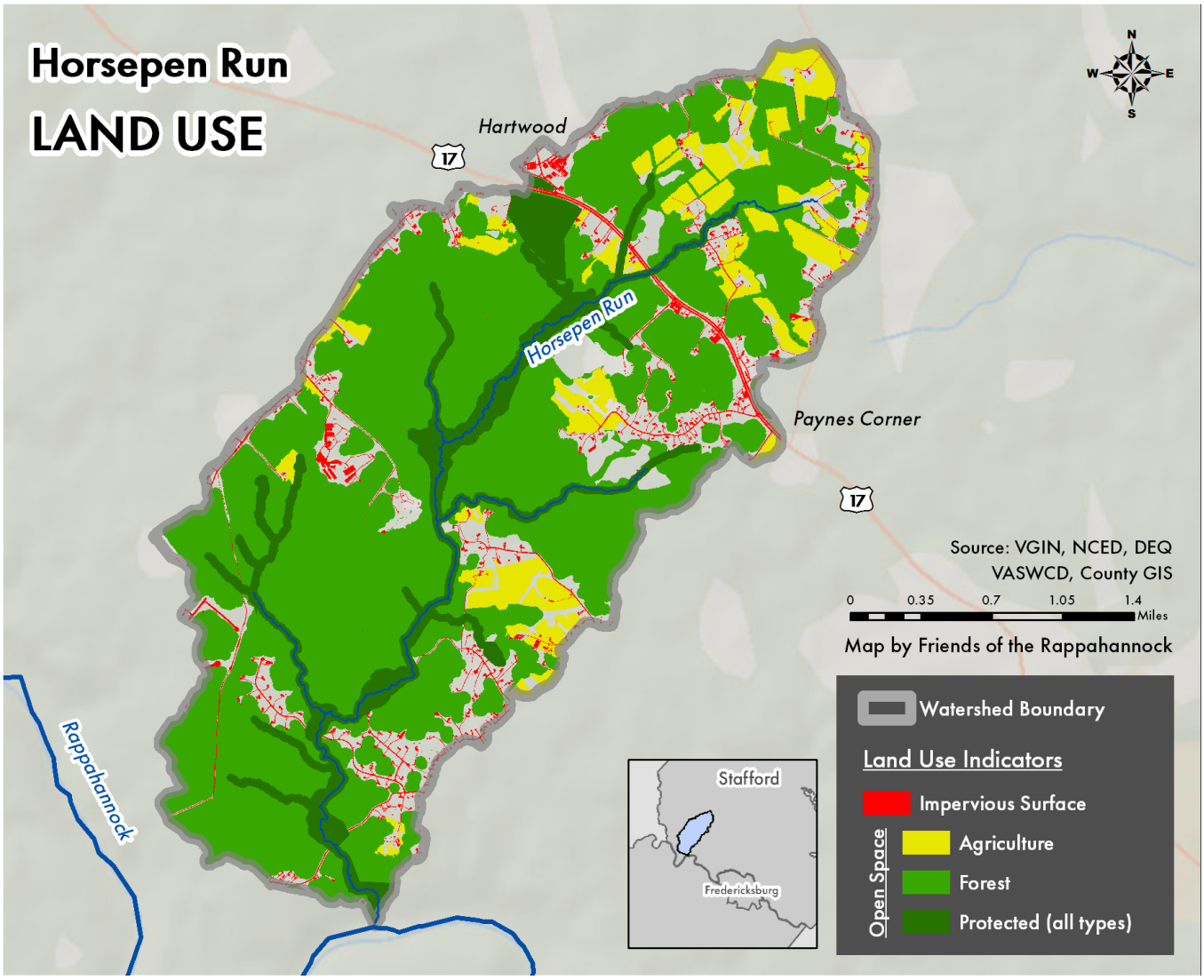
For more information on indicators and grading scales, see Appendix 1

Horsepen Run

LAND USE: C+

A	D	D	A
Forest-Impervious Ratio	Open Space Protection	Agricultural BMPs	Residential BMPs
24.1 to 1 forest to impervious surface ratio	12.3% of open spaces under protection	1% of farmland treated by year, average 2007-2017	6.25 residential BMPs installed in past 3 years using state cost share

For more information on indicators and grading scales, see Appendix 1

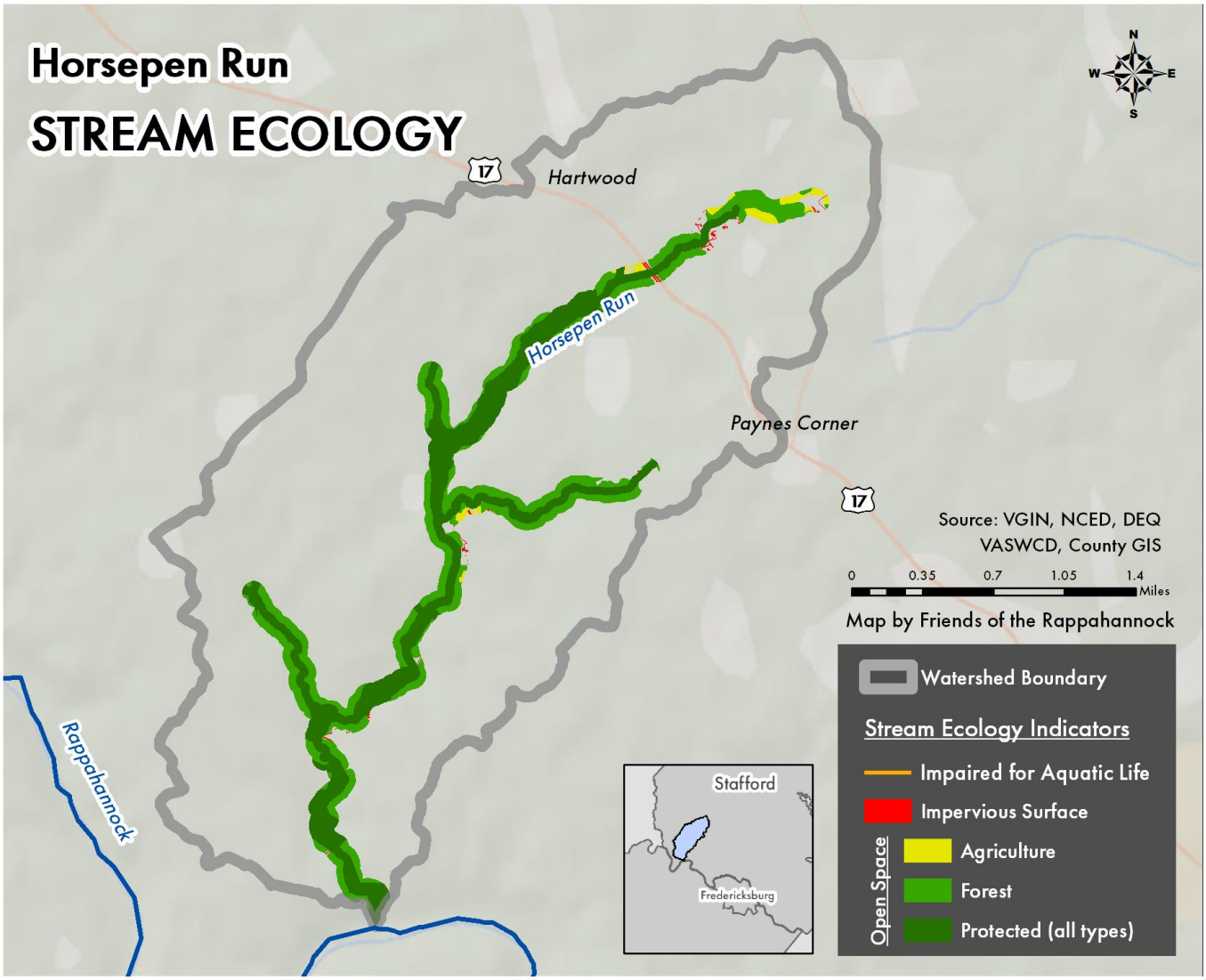


Horsepen Run

STREAM ECOLOGY: B+

A	A	A	C
Aquatic Life	Impervious Surfaces	Forest Canopy	Open Space Protection
0% of stream-miles listed as impaired for aquatic life	0.9% of land within 300 feet of perennial streams are impervious	93.3% of land within 300 feet of perennial streams are forested	58.7% of open spaces within 300 feet of perennial streams under protection

For more information on indicators and grading scales, see Appendix 1

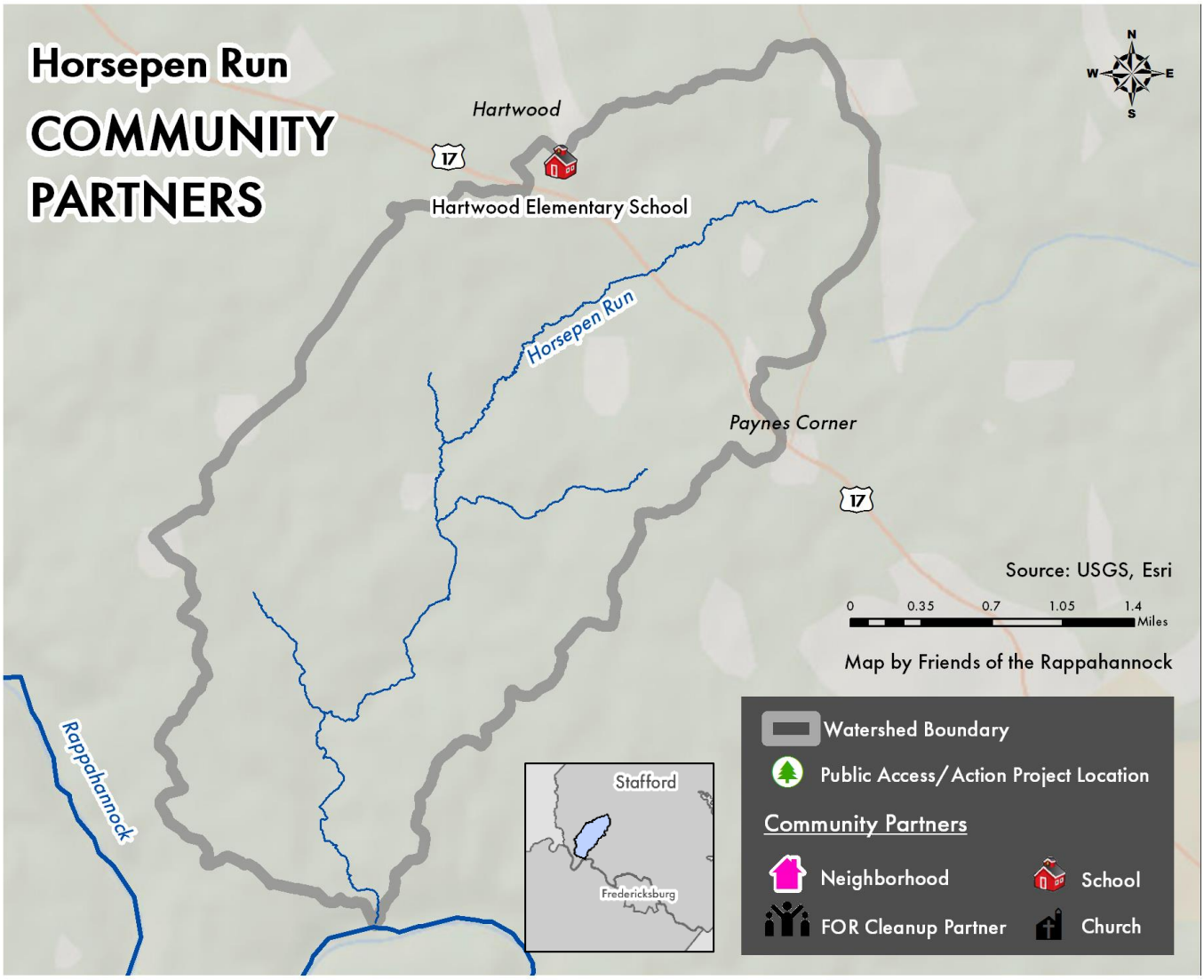


Horsepen Run

COMMUNITY ENGAGEMENT: F

Public Access	Watershed Education	River Cleanups	Road Crossing Signage
Fail	C	N/A	F
No public access points	14.9% of K-8 public school students attended FOR field trip in last 2 school years	No public access	0% (0 of 2) stream/road crossings marked with stream name

For more information on indicators and grading scales, see Appendix 1



White Oak Run Report Card

C

Subject	Grade	Comments
Human Health	B	• 15% of stream-miles have unsafe bacteria count • No Fish consumption advisories
Land Use	C	• 11.2:1 forest-impervious ratio • No residential BMPs installed in the past 3 years
Stream Ecology	C	• 39% of stream-miles listed as impaired for aquatic life • 82% of land within 300 feet of a perennial stream is covered by forested area
Community Engagement	F	• 20% of road crossings marked • No public access

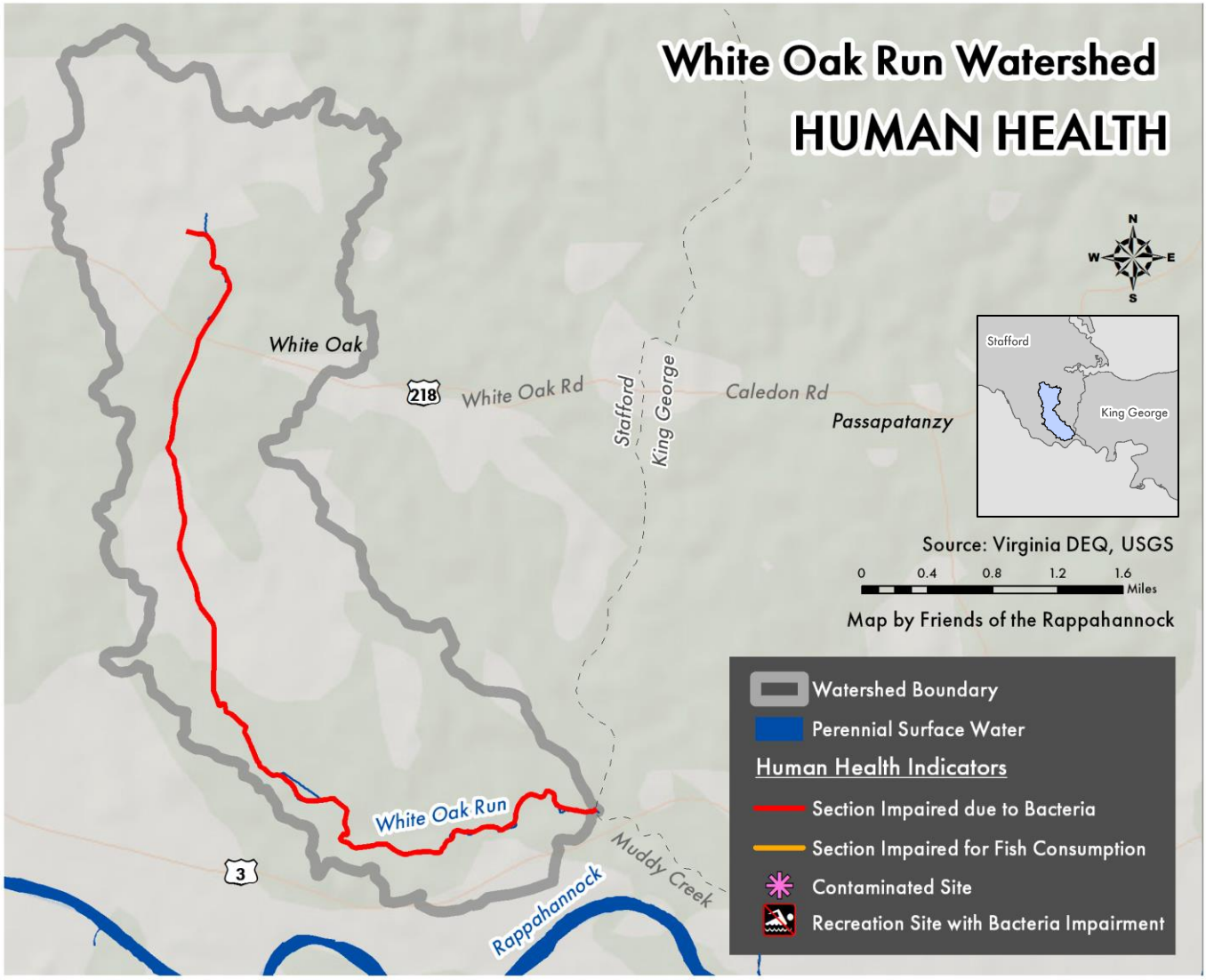
*Using state cost shares

White Oak Run

HUMAN HEALTH: B

Bacteria	Fish Consumption	Contaminated Sites	Recreational Health Risk
D	A	Pass	Pass
15.2% of stream-miles listed as impaired for recreation due to bacteria	0% of stream-miles listed as impaired for contaminated fish tissue	No contaminated sites	No impairment at recreation sites

For more information on indicators and grading scales, see Appendix 1

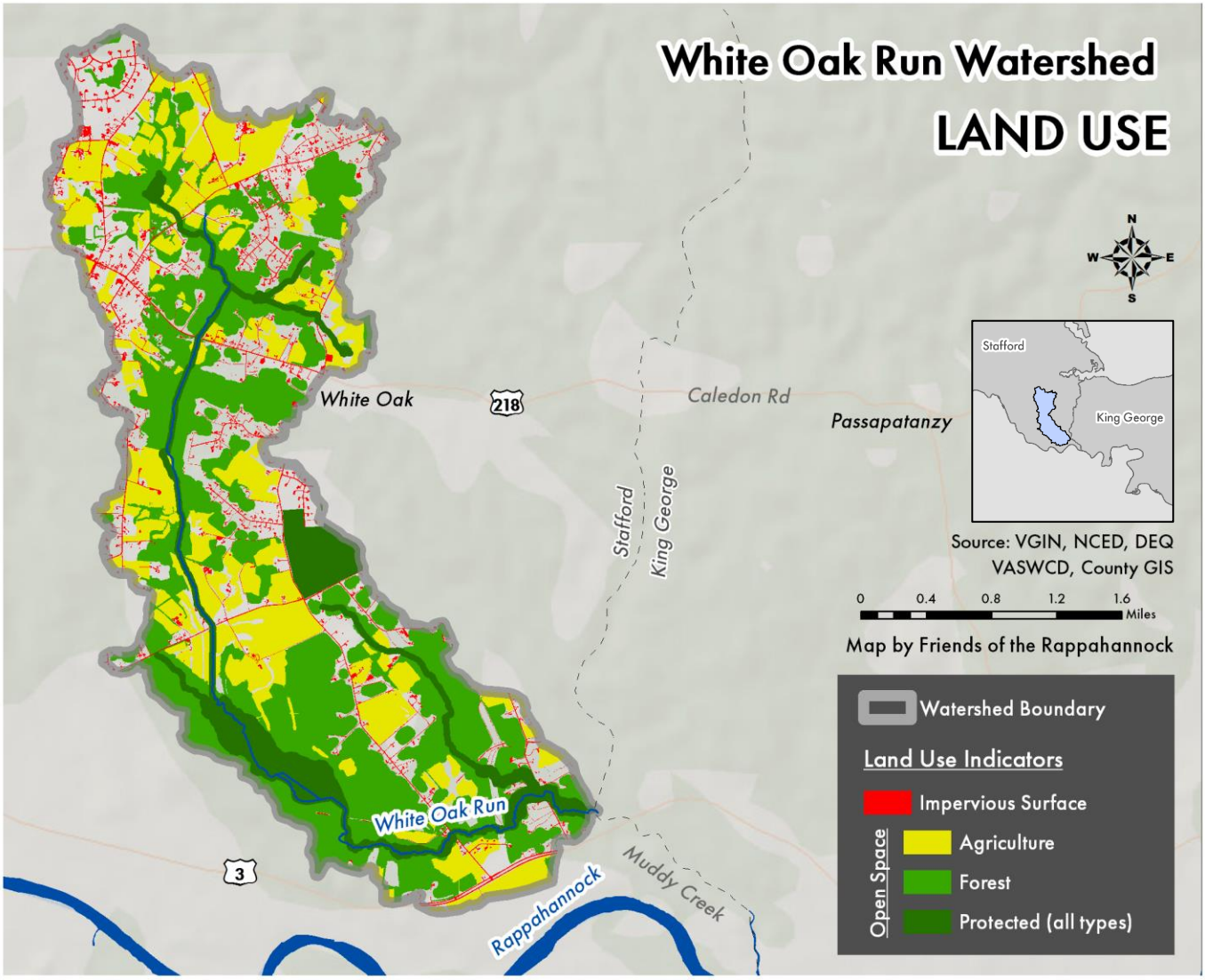


White Oak Run

LAND USE: C

B	D	A	F
Forest-Impervious Ratio	Open Space Protection	Agricultural BMPs	Residential BMPs
11.2 to 1 forest to impervious surface ratio	12.3% of open spaces under protection	42.1% of farmland treated by year, average 2007-2017	0 residential BMPs installed in past 3 years using state cost share

For more information on indicators and grading scales, see Appendix 1

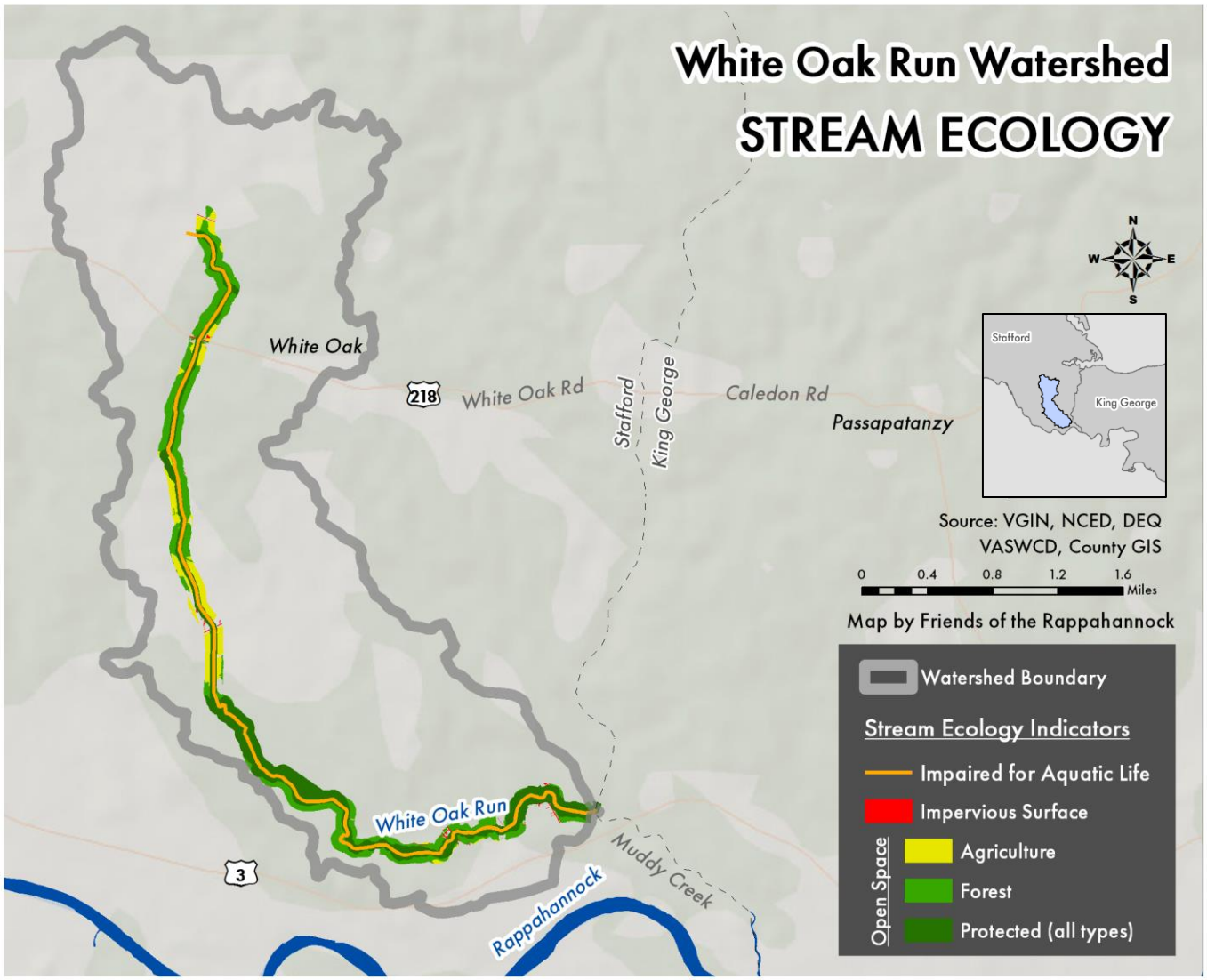


White Oak Run

STREAM ECOLOGY: C

F	A	B	C
Aquatic Life	Impervious Surfaces	Forest Canopy	Open Space Protection
39.2% of stream-miles listed as impaired for aquatic life	1.0% of land within 300 feet of perennial streams are impervious	82.3% of land within 300 feet of perennial streams are forested	56.3% of open spaces within 300 feet of perennial streams under protection

For more information on indicators and grading scales, see Appendix 1

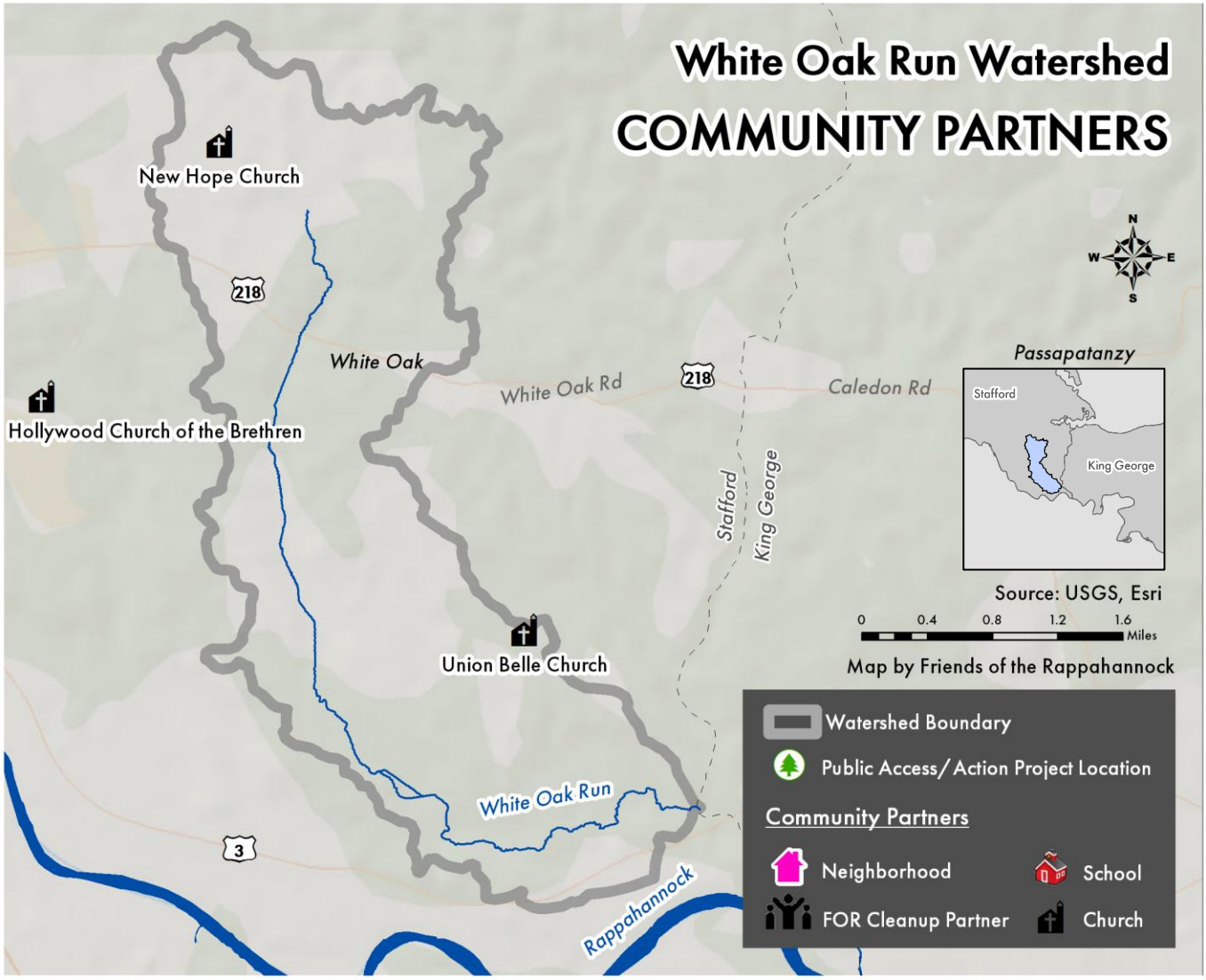


White Oak Run

COMMUNITY ENGAGEMENT: F

Public Access	Watershed Education	River Cleanups	Road Crossing Signage
Fail	N/A	N/A	D
No access via public parks or trails	No schools in watershed	No public access for cleanups	20% (1 of 5) stream/road crossings marked with stream name

For more information on indicators and grading scales, see Appendix 1



Stream Superlatives

The star students and the class clowns from our Middle Rappahannock Report Card

THE DEAN'S LIST – *The top of the class. These streams excelled in selected indicators.*

Open Space Protection – Portobago Creek

The Portobago Creek watershed has over 90 percent of its open spaces permanently conserved under ownership or easement, by far the highest rate of protection among the Report Card tributaries. About 85 percent of the Portobago Creek watershed lies in Army Fort A.P. Hill. Military bases like Fort A.P. Hill are an under-appreciated source of land protection. Thanks to this land protection, a number of rare plant and animal species including threatened and endangered bats and the rarest orchid east of the Mississippi exist at Fort A.P. Hill.

Open Space Protection – Deep Run (South)

Although the Deep Run watershed is highly developed and populated, Deep Run earned an A in Open Space Protection by having 64 percent of its remaining open spaces in conservation, well above the 30% threshold. Most of the conserved open space is in a single park, the Fredericksburg National Battlefield Park, which is owned by the National Park Service. This demonstrates how our nation's historic parks have environmental benefits, too.

Residential BMPs – Horsepen Run

Of the 11 watersheds, only 1 achieved a passing grade for residential BMPs. Horsepen Run contains the only residential BMP installed during the last 3 years in any Report Card tributary. We need to ramp up our efforts to manage stormwater in our area. No effort is too small to help manage our stormwater. Cost-shares are available through local Soil and Water Conservation District including Tri-County City SWCD and Hanover SWCD.

Impervious Surfaces – Muddy Creek (<1% impervious)

A very rural watershed with a mosaic of farms and fields, Muddy Creek has not experienced as much urban growth as tributaries closer to downtown Fredericksburg. Consequently, less than 1% of the land within 300 feet of the perennial streams in the Muddy Creek watershed is under impervious surfaces. Other watersheds have as high as 17 percent of their riparian zones. As Muddy Creek develops, it is important that we continue limiting the impervious surfaces built nearby.

Cleanups - Hazel Run

As an urban stream that drains the largest shopping center on the east coast, Hazel Run has many challenges. Community Action isn't one of them. Between 2015 and 2017, over 75 FOR volunteers put in time for 6 cleanups along Hazel Run and tributary Smith Run, removing nearly 2000 pounds of trash, good enough for a B. This does not include non-FOR cleanups.

Watershed Education – Hazel Run

Two of the 4 public schools in the Hazel Run watershed attended an FOR field trip over the past 2 years. One of those schools singlehandedly lifted the Hazel Run watershed into "B" range for Watershed Education. Lafayette Upper Elementary School accomplished the rare feat of bringing over 100% of its student enrollment to FOR during that time period. That means that nearly every student at Lafayette Upper Elementary experienced watershed education, and some students more than once.

Public Access – England Run

England Run Trail is a great example of the impact of public access on small watershed stewardship. When you have trail access to a stream, especially one that's connected to nearby neighborhoods, citizens are more likely to feel a sense of ownership and work to clean it up. Thanks to this convenient stream access, little England Run punched above its weight class and was the only tributary to earn an A in River Cleanups.

THE STRUGGLE BUS – *It's time to get those grades up! These watersheds have work to do.*

River Cleanups - Massaponax Creek

Massaponax Creek has one of the best trails networks of any tributary in the Report Card. However, Friends of the Rappahannock only held one cleanup in the Massaponax Creek watershed during the last 3 years, which is less than one tenth of the goal of one cleanup per 10,000 population per year. To earn an A, FOR must facilitate 5 cleanups a year in the Massaponax Creek watershed. We must get better at cleaning up Massaponax Creek.

Bacteria – Hazel Run

Among the most debilitating challenges faced by Hazel Run is bacteria. Fourteen percent of the perennial stream-miles in the Hazel Run watershed are state listed as being potentially unsafe for recreation including swimming, boating, and "primary" activities that involve direct contact with water. This impaired reach includes Alum Spring Park, which is regularly used by the public for recreation. Unsafe levels of bacteria are unacceptable at a site that is used by the public for recreation. It is urgent that local governments commit resources to fixing the bacterial contamination affecting Hazel Run so we can make this valuable community resource safer.

Aquatic Life - Falls Run

The entire length of Falls Run is listed as being impaired for aquatic life. This designation was established based on field surveys of benthic macroinvertebrates (the insects that inhabit the stream bottom) that revealed significant declines in aquatic life biodiversity or populations. This means that the water quality in Falls Run is so poor that it cannot support a healthy population of aquatic insects, which are a foundation piece of the aquatic ecological community. As an urban stream located along a built-out urban corridor, with few open spaces left to refill the stream with clean water, true recovery will be extremely difficult for Falls Run. Falls Run is an cautionary tale and an example of how delicate the balance of nature can be, and it is a reminder of why we must protect our clean water resources before they're gone for good.

Stream Crossing Signage – Massaponax Creek

As the most populated watershed in the Report Card study, at approximately 50,000 people, the Massaponax Creek watershed is crisscrossed with a sprawling network of roads. A road crossing takes advantage of a captive audience—drivers—and gives streams an identity, assigning them importance and even personality. Of the 16 lined roads that cross Massaponax Creek and its perennial tributaries, only 1 was marked with the name of the stream. Every unmarked crossing is a missed opportunity to remind hundreds or in some cases thousands of local citizens a day that there's a "there" there.

Appendix 1: Indicator Overviews

Indicator Overview	**Bacteria**	Subject: Human Health

Why it's important	The Rappahannock River basin has many sections and tributaries that are impaired due to bacteria. These include Escherichia coli (E. coli), enterococci, and fecal coliforms. These bacteria are often times naturally occurring and are present in most waterways. In low concentrations, they have very little impact on human health. Unfortunately, many of our water ways continue to show concentrations above EPA thresholds and pose a significant risk to human health. Bacteria impairments make it unsafe to use our water resources for recreation and is an important indicator of overall watershed health.					
Grading Scale	**Definition**: The percentage of total stream-miles in the tributary watershed that were listed as impaired for Recreation by VADEQ due to bacteria levels, in the most recent 305(b) report					
	A	B	C	D	F	
	0% of stream miles listed	0-5% of stream miles listed	5-10% of stream miles listed	10-20% of stream miles listed	>20% of stream miles listed	
Results	*Claiborne Run*	C	9.8% of stream miles listed			
	Deep Run North	C	8.2% percent of stream miles listed			
	Deep Run South	A	No stream miles listed			
	England Run	A	No stream miles listed			
	Falls Run	A	No stream miles listed			
	Hazel Run	D	13.8% percent of stream miles listed			
	Horsepen Run	C	6.1% percent of stream miles listed			
	Massaponax Creek	D	16.8% percent of stream miles listed			
	Muddy Creek	B	5% percent of stream miles listed			
	Portobago Creek	C	7.4% percent of stream miles listed			
	White Oak Run	D	15.2% percent of stream miles listed			

Methodology

Using GIS data layer obtained through DEQ, the total stream miles shown as "not supporting" for recreation were divided by the overall stream miles in the tributary to produce the result.

Sources

Virginia Department of Environmental Quality. *Final 2016 305(b)/303(d) Water Quality Assessment Integrated Report.* Approved by EPA March 6, 2018. GIS data obtained through request to DEQ. https://www.deq.virginia.gov/Programs/Water/WaterQualityInformationTMDLs/WaterQualityAssessments/2016305b303dIntegratedReport.aspx

Indicator Overview	**Fish Consumption**	Subject: Human Health

Why it's important

One of the primary ways we connect with our waterways is through fishing. The Rappahannock River provides millions of dollars to the seafood economy and the ability of a waterway to provide high quality habitat for our fish and wildlife is paramount. A fish consumption advisory is issued if there are any fish populations found to be contaminated with any substances that exceed EPA health and safety thresholds. This portion of the Rappahannock River was at one time exposed to polychlorinated biphenyls (PCBs) which are still present in the river bed sediments in some areas. This indicator is included to inform the public about safe fishing practices and to provide information to decision makers.

Grading Scale

Definition: The percentage of total stream-miles in the tributary watershed that were listed as impaired for Fish Tissue by VADEQ due to heavy metals due to heavy metals, in the most recent 305(b) report

A	B	C	D	F
0% of stream miles listed	0-5% of stream miles listed	5-10% of stream miles listed	10-20% of stream miles listed	>20% of stream miles listed

Results

Claiborne Run	F	25.1% of stream miles listed
Deep Run North	A	No stream miles listed
Deep Run South	A	No stream miles listed
England Run	A	No stream miles listed
Falls Run	A	No stream miles listed
Hazel Run	F	19.7% of stream miles listed
Horsepen Run	A	No stream miles listed
Massaponax Creek	A	No stream miles listed
Muddy Creek	A	No stream miles listed
Portobago Creek	A	No stream miles listed
White Oak Run	A	No stream miles listed

Methodology

Using GIS data layer obtained through DEQ, the total stream miles shown as "not supporting" for fish tissue were divided by the overall stream miles in the tributary to produce the result.

Sources

Virginia Department of Environmental Quality. *Final 2016 305(b)/303(d) Water Quality Assessment Integrated Report.* Approved by EPA March 6, 2018. GIS data obtained through request to DEQ. https://www.deq.virginia.gov/Programs/Water/WaterQualityInformationTMDLs/WaterQualityAssessments/2016305b303dIntegratedReport.aspx

Indicator Overview	Contaminated Sites	Subject: Human Health

Why it's important

A Brownfield site is any land in the United States that has been contaminated by hazardous waste and identified by the Environmental Protection Agency (EPA) as a candidate for cleanup because it poses a risk to human health and/or the environment. Superfund sites are cleanup sites if the federal government is or plans to be involved in cleanup efforts. Brownfield and Superfund sites can contribute harmful pollutants directly into streams during rain events, seep pollutants into the groundwater table which then travels to our waterways, and contribute trash and debris to our forests, streets, and waterways. Contaminated sites were included to increase public awareness of these sites.

Grading Scale

Definition: Presence of one or more EPA listed brownfield or Superfund site in watershed indicates a fail

PASS	FAIL
No contaminated Superfund or Brownfield sites in watershed	One or more contaminated Superfund or brownfield site in watershed.

Results

Claiborne Run	Pass	No brownfield or Superfund sites
Deep Run North	Pass	No brownfield or Superfund sites
Deep Run South	Fail	Cowan Crossing brownfield site
England Run	Pass	No brownfield or Superfund sites
Falls Run	Pass	No brownfield or Superfund sites
Hazel Run	Pass	No brownfield or Superfund sites
Horsepen Run	Pass	No brownfield or Superfund sites
Massaponax Creek	Fail	L.A. Clarke & Son Superfund Site
Muddy Creek	Pass	No brownfield or Superfund sites
Portobago Creek	Pass	No brownfield or Superfund sites
White Oak Run	Pass	No brownfield or Superfund sites

Sources

Brownfield and Superfund sites locations were obtained from the EPA's Facility Registry Service at https://www.epa.gov/frs.

Indicator Overview	**Recreational Health Risk**	Subject: Human Health

Why it's important

Exposure to water that is unsafe for recreation is a public health risk. Community members that use public access sites that allow swimming should be aware of DEQ impairment listings for recreation. This indicator is intended to raise public awareness of recreation impairment at public stream access sites.

Grading Scale

Definition: Any VADEQ listed Recreation impairment at any public recreation site that allows swimming site earns a Fail.

PASS	FAIL
No public access sites allowing swimming are listed as impaired for recreation	One or more public access sites allowing swimming are listed as impaired for recreation

Results

Claiborne Run	Pass	No impaired public access sites found
Deep Run North	Pass	No impaired public access sites found
Deep Run South	Pass	No impaired public access sites found
England Run	Pass	No impaired public access sites found
Falls Run	Pass	No impaired public access sites found
Hazel Run	Fail	Recreation impairment at Alum Spring Park
Horsepen Run	Pass	No impaired public access sites found
Massaponax Creek	Pass	No impaired public access sites found
Muddy Creek	Pass	No impaired public access sites found
Portobago Creek	Pass	No impaired public access sites found
White Oak Run	Pass	No impaired public access sites found

Sources

Recreation access sites were obtained from county GIS websites. Waterbody impairment status was gathered from VADEQ 305b reports: https://www.deq.virginia.gov/Programs/Water/WaterQualityInformationTMDLs/WaterQualityAssessments/2016305b303dIntegratedReport.aspx

Indicator Overview	**Forest-Impervious Ratio**	Subject: Land Use

Why it's important

The land cover of a watershed is a very important indicator of watershed health. Different land covers and land use types have very different resulting impacts on waterways. Mature forests intercept rainfall before it reaches the ground, slowing any stormwater runoff. Vegetation has strong root systems that reduce erosion and protect our waterways from other forms of pollution. Conversely, hardened impervious surfaces provide no ecosystem services and exacerbate stormwater runoff which flows off parking lots and other impervious surfaces at high velocities and can carry a variety of pollutants directly into storm drains and waterways.

Grading Scale

Definition: The ratio of forested area to impervious surface within the tributary watershed

A	B	C	D	F
>20:1	10:1 - 20:1	5:1 - 10:1	2:1 - 5:1	< 2:1

Results

Claiborne Run	F	1.9 to 1 forest-impervious ratio
Deep Run North	A	27.9 to 1 forest-impervious ratio
Deep Run South	D	2.3 to 1 forest-impervious ratio
England Run	D	2.2 to 1 forest-impervious ratio
Falls Run	F	1.6 to 1 forest-impervious ratio
Hazel Run	F	1.2 to 1 forest-impervious ratio
Horsepen Run	A	24.1 to 1 forest-impervious ratio
Massaponax Creek	D	3.1 to 1 forest-impervious ratio
Muddy Creek	B	15.6 to 1 forest-impervious ratio
Portobago Creek	A	49.2 to 1 forest-impervious ratio
White Oak Run	B	11.2 to 1 forest-impervious ratio

Methodology

Forest canopy included VGIN land cover classes ("Forest", "Tree", and "Woody Wetland"). Impervious surfaces included classes ("Impervious (Extracted)" and "Impervious (Local)")

Sources

Virginia Geographic Information Network (VGIN) 2016 Land Cover Dataset. Downloaded October 2017 from: https://www.vita.virginia.gov/integrated-services/vgin-geospatial-services/land-cover/

Indicator Overview	Open Space Protection	Subject: Land Use

Why it's important	Natural areas such as forests and wetlands are valuable natural resources that naturally filter water through groundwater and ecological processes. Open spaces dedicated to agricultural uses, while certainly contributing to water pollution, are extremely low in impervious surfaces and are preferable to urban land uses in terms of their water quality effects. Open space protection using ownership, easement, or via resource protection area designation can help prevent agricultural and forest lands from becoming developed into urban land uses.					
Grading Scale	**Definition**: The percent of open spaces (undeveloped land) that are currently under protection via ownership, easement, or a Resource Protection Area.					
	A	B	C	D	F	
	>30%	20-30%	15-20%	10-15%	<10%	
Results	*Claiborne Run*	A	34.4% of open spaces protected			
	Deep Run North	F	8.4% of open spaces protected			
	Deep Run South	A	64.1% of open spaces protected			
	England Run	B	21.3% of open spaces protected			
	Falls Run	C	18.2% of open spaces protected			
	Hazel Run	D	13.0% of open spaces protected			
	Horsepen Run	D	12.3% of open spaces protected			
	Massaponax Creek	B	20.2% of open spaces protected			
	Muddy Creek	B	20.0% of open spaces protected			
	Portobago Creek	A	90.1% of open spaces protected			
	White Oak Run	D	12.3% of open spaces protected			

Methodology

Open spaces were defined as VGIN land cover classes ("Forest", "Tree", "Scrub/Shrub", "Pasture", "Cropland", "Woody Wetlands", and "Emergent Wetlands"). Protected lands were defined as any lands that have protection according to the National Conservation Easement Database, as well as any lands in Resource Protection Area as defined by county governments. The total protected area was divided by the total Open Space acreage to produce the result.

Sources

Virginia Geographic Information Network (VGIN) 2016 Land Cover Dataset. Downloaded October 2017 from: https://www.vita.virginia.gov/integrated-services/vgin-geospatial-services/land-cover/

County RPA datasets obtained from County GIS websites.

National Conservation Easement Database 2016. https://www.conservationeasement.us/

Indicator Overview	**Agricultural BMPs**	Subject: Land Use

Why it's important	Agriculture is one of the largest land uses in the Rappahannock River watershed and is the largest pollution source sector impacting the Rappahannock River and Chesapeake Bay. To address nutrients and pollution leaving agricultural fields, conservation groups like Friends of the Rappahannock and Tri County-City Soil and Water Conservation District (TCCSWCD) work with producers to provide technical assistance and cost-share for a myriad of agricultural best management practices (BMPs), to mitigate pollution and to protect our waterways.

Grading Scale

Definition: Percent of agricultural acres treated by BMP per year (yearly average)

A	B	C	D	F	NA
>30%	20-30%	10-20%	1-10%	>10	Less than 2% Ag

Results

Claiborne Run	A	45.0% of Ag lands treated, average 2007-2017
Deep Run North	D	3.9% of Ag lands treated, average 2007-2017
Deep Run South	A	47.4% of Ag lands treated, average 2007-2017
England Run	NA	0.0% of Ag lands treated, average 2007-2017
Falls Run	F	0.0% of Ag lands treated, average 2007-2017
Hazel Run	D	2.1% of Ag lands treated, average 2007-2017
Horsepen Run	D	1.0% of Ag lands treated, average 2007-2017
Massaponax Creek	C	14.8% of Ag lands treated, average 2007-2017
Muddy Creek	C	11.5% of Ag lands treated, average 2007-2017
Portobago Creek	B	22.6% of Ag lands treated, average 2007-2017
White Oak Run	A	42.1% of Ag lands treated, average 2007-2017

Methodology

The total acreage of Ag BMP treatments as indicated by DCR records, divided by the acres of farmland (VGIN classes "Cropland" or "Pasture") within the tributary watershed, divided by the number of years of data considered. Includes all BMP installations and nutrient management plans, excluding maintenance.

Sources

Virginia Department of Conservation and Recreation, Virginia Agricultural BMP and CREP Database Query Form. *http://consapps.dcr.virginia.gov/htdocs/progs/BMP_query.aspx (2007-2017). Location data available upon request from DCR.*

Virginia Geographic Information Network (VGIN) 2016 Land Cover Dataset. Downloaded October 2017 from: https://www.vita.virginia.gov/integrated-services/vgin-geospatial-services/land-cover/

Indicator Overview	**Residential BMPs**	Subject: Land Use

Why it's important

The fastest-growing pollution source in our area is urban and suburban stormwater runoff, which is occurring due to land use changes brought on by population growth. Many residential properties have inadequate or no stormwater management on site to prevent polluted stormwater runoff from entering our waterways. Residential and commercial property owners have access to several state and local programs to assist with design and installation of stormwater best management practices (BMPs). Examples include rain barrels, rain gardens, and urban tree plantings.

Grading Scale

Definition: Number of state cost-share funded urban stormwater BMPs per 50,000 population per year

A	B	C	D	F
>1	0.6-1	0.3-0.6	0-0.3	No BMPs

Results

Claiborne Run	Fail	No BMPs
Deep Run North	Fail	No BMPs
Deep Run South	Fail	No BMPs
England Run	Fail	No BMPs
Falls Run	Fail	No BMPs
Hazel Run	Fail	No BMPs
Horsepen Run	Pass	20.8 BMPs per 50,000 population per year
Massaponax Creek	Fail	No BMPs
Muddy Creek	Fail	No BMPs
Portobago Creek	Fail	No BMPs
White Oak Run	Fail	No BMPs

Sources

Residential BMP data obtained by request from Virginia Association of Soil and Water Conservation Districts. Includes all residential BMPs installed using SWCD-administered cost share. Population data obtained using Census Bureau census block data (2010).

Indicator Overview	Aquatic Life	Subject: Stream Ecology

Why it's important

Our local waterways are a complex network of ecosystems that support an incredible amount of flora and fauna. These intricate systems depend on each other to properly function and when one or more components of an ecosystem is compromised, the rest of the system cannot function properly. One of the metrics Friends of the Rappahannock and VA Department of Environmental Quality considers is the health or impairment of aquatic life. Signs of aquatic impairment include water chemistry issues like pH and dissolved oxygen, as well as degradation of macroinvertebrates (aquatic insect) populations. FOR includes this indicator as a way to point decision makers toward damaged waterways and work towards identifying solutions.

Grading Scale

Definition: The percentage of total stream-miles in the tributary watershed that were listed as impaired for Aquatic Life by the Virginia Department of Environmental Quality, as included in the most recent 305(b) report

A	B	C	D	F
0% of stream miles listed	0-5% of stream miles listed	5-10% of stream miles listed	10-20% of stream miles listed	>20% of stream miles listed

Results

Claiborne Run	A	No stream miles listed
Deep Run North	A	No stream miles listed
Deep Run South	D	10.3% of stream miles listed due to pH
England Run	A	No stream miles listed
Falls Run	F	43.9% of stream miles listed due to benthic macroinvertebrates
Hazel Run	D	19.7% of stream miles listed due to benthic macroinvertebrates
Horsepen Run	A	No stream miles listed
Massaponax Creek	C	9.6% of stream miles listed due to pH
Muddy Creek	D	12.8% of stream miles listed due to benthic macroinvertebrates
Portobago Creek	D	19.2% of stream miles listed due to dissolved oxygen
White Oak Run	F	39.2% of stream miles listed due to pH and benthic macroinvertebrates

Sources

Virginia Department of Environmental Quality. *Final 2016 305(b)/303(d) Water Quality Assessment Integrated Report.* Approved by EPA March 6, 2018. https://www.deq.virginia.gov/Programs/Water/WaterQualityInformationTMDLs/WaterQualityAssessments/2016305b303dIntegratedReport.aspx

GIS data obtained through request to DEQ.

Indicator Overview	**Impervious Surfaces**	Subject: Stream Ecology

Why it's important

Riparian areas are the corridors directly adjacent to waterways and are among the most important land areas in a watershed. Streams with high concentrations of impervious surfaces generally have much higher impacts than streams with healthy riparian areas. Impervious areas require best management practices to catch and treat stormwater runoff prior to entering a waterway to avoid erosion and pollution. Performing this assessment will provide localities with an inventory of areas in need of restoration projects to convert impervious areas to vegetated areas in an effort to protect or improve water quality.

Grading Scale

Definition: The percent of watershed area within 300 feet on either side of any perennial stream that is impervious

A	B	C	D	F
<2%	2-5%	5-10%	10-15%	>15%

Results

Claiborne Run	F	17.4% impervious
Deep Run North	A	1.2% impervious
Deep Run South	C	9.6% impervious
England Run	B	4.3% impervious
Falls Run	A	0.9% impervious
Hazel Run	D	12.7% impervious
Horsepen Run	A	0.9% impervious
Massaponax Creek	C	5.6% impervious
Muddy Creek	A	0.9% impervious
Portobago Creek	A	0.5% impervious
White Oak Run	A	1% impervious

Methodology

Impervious were defined as VGIN land cover classes ("Impervious (Extracted)" and "Impervious (Local)"). Perennial streams were selected based on National Hydrologic Dataset data.

Sources

Virginia Geographic Information Network (VGIN) 2016 Land Cover Dataset. Downloaded October 2017 from: https://www.vita.virginia.gov/integrated-services/vgin-geospatial-services/land-cover/

USGS National Hydrologic dataset 2016. https://nhd.usgs.gov/NHD_High_Resolution.html

Indicator Overview	**Forest Canopy**	Subject: Stream Ecology

Why it's important

Riparian areas are the corridors directly adjacent to waterways and are among the most important land areas in a watershed. Vegetated riparian buffers are the most effective strategy to protect waterways from pollution. They also are essential habitat areas for fish and wildlife. A healthy, dense, and diverse vegetated riparian buffer is a strong indicator of stream health.

Grading Scale

Definition: The percent of watershed area within 300 feet on either side of any perennial stream that are forested

A	B	C	D	F
>90%	80-90%	70-80%	60-70%	<60%

Results

Claiborne Run	F	57.3% canopy cover
Deep Run North	B	88.5% canopy cover
Deep Run South	D	66.0% canopy cover
England Run	B	81.4% canopy cover
Falls Run	C	76.0% canopy cover
Hazel Run	C	70.4% canopy cover
Horsepen Run	A	93.3% canopy cover
Massaponax Creek	F	47.1% canopy cover
Muddy Creek	B	84.9% canopy cover
Portobago Creek	A	92.6% canopy cover
White Oak Run	B	82.3% canopy cover

Sources

Methodology

Forest canopy was defined as VGIN land cover classes ("Forest", "Tree", or "Woody Wetland"). Perennial streams were selected based on National Hydrologic Dataset data.

Sources

Virginia Geographic Information Network (VGIN) 2016 Land Cover Dataset. Downloaded October 2017 from: https://www.vita.virginia.gov/integrated-services/vgin-geospatial-services/land-cover/

USGS National Hydrologic dataset 2016. https://nhd.usgs.gov/NHD_High_Resolution.html

Indicator Overview	**Open Space Protection**	Subject: Stream Ecology

Why it's important

One of the largest threats to our local water resources is development and encroachment of impervious surfaces. Riparian land protection is an essential land use mechanism which provides substantial ecosystem services including protecting water quality and habitat for fish and wildlife. In Planning District 16, many water resources are protected through the use of "Resource Protection Areas" which protects 100 feet. In many cases 100 feet is not enough to prevent pollution and degradation. Larger protected land areas provide higher quality water resources and ecosystem services.

Grading Scale

Definition: The percent of open spaces (undeveloped land) that are currently under protection via ownership, easement, or a Resource Protection Area, within 300 feet on either side of any perennial stream

A	B	C	D	F
>80%	60-80%	40-60%	20-40%	<20%

Results

Claiborne Run	C	59.3% of open spaces within 300 feet protected
Deep Run North	D	24.9% of open spaces within 300 feet protected
Deep Run South	B	79.5% of open spaces within 300 feet protected
England Run	B	61.4% of open spaces within 300 feet protected
Falls Run	C	42.5% of open spaces within 300 feet protected
Hazel Run	C	42.9% of open spaces within 300 feet protected
Horsepen Run	C	58.7% of open spaces within 300 feet protected
Massaponax Creek	B	60.4% of open spaces within 300 feet protected
Muddy Creek	B	62.8% of open spaces within 300 feet protected
Portobago Creek	A	96.5% of open spaces within 300 feet protected
White Oak Run	D	56.3% of open spaces within 300 feet protected

Methodology

See 'Open Space Protection' indicator overview. Used identical methodology, this time within 300 feet of any perennial stream as selected based on National Hydrologic Dataset data.

Sources

See 'Open Space Protection' indicator overview

USGS National Hydrologic dataset 2016. https://nhd.usgs.gov/NHD_High_Resolution.html

Indicator Overview	**Public Access**	Subject: Community Engagement

Why it's important

Public access to waterways and other natural resources is an essential part of maintaining the health of waterways in developed areas. The basic principle being, if people can see, use, and appreciate a pristine resource like a stream, then they are less likely to contribute to pollution and more likely to engage to protect a resource. Public access also encourages economic development that supports these natural resources. Connecting our communities with recreational opportunities is an excellent way for decision makers to protect our natural resources.

Grading Scale

Definition: A public access site is defined as a park or trail that provides public access to the tributary or a perennial waterbody within the tributary watershed

PASS	FAIL
One or more public access site in watershed	No public access sites in watershed

Results

Claiborne Run	FAIL	No public access sites found
Deep Run North	FAIL	No public access sites found
Deep Run South	PASS	Public Access at Lee Drive/ Battlefield Trail
England Run	PASS	Public Access at England Run Trail
Falls Run	FAIL	No public access sites found
Hazel Run	PASS	Public Access at Alum Springs Park
Horsepen Run	FAIL	No public access sites found
Massaponax Creek	PASS	Public Access at Loriella Park/ Massaponax Creek Trail
Muddy Creek	FAIL	No public access sites found
Portobago Creek	PASS	Public Access through AP Hill
White Oak Run	FAIL	No public access sites found

Sources

Public access obtained through county GIS websites

Indicator Overview	**Watershed Education**	Subject: Community Engagement

Why it's important

Environmental education is essential to ensure the leaders of tomorrow understand the importance of healthy ecosystems and water resources. The Planning District 16 region is very fortunate to have a variety of organizations that provide watershed education opportunities and programs to teach region's youth about nature, pollution, and clean water. These lessons are then brought home and incorporated into their daily lives creating a whole generation of environmental stewards. A higher environmental literacy will produce a healthier watershed. Data only includes FOR field trips.

Grading Scale

Definition: The percent of total K-8 public school enrollment in each watershed participating in an FOR field trip in previous two school years

A	B	C	D	F	NA
40%+	25-40%	10-25%	1-10%	0%	No schools in watershed

Results

Claiborne Run	A	56% of K-8 enrollment attended FOR field trip
Deep Run North	NA	NA – no schools in watershed
Deep Run South	F	0% of K-8 enrollment attended FOR field trip
England Run	NA	NA – no schools in watershed
Falls Run	F	0% of K-8 enrollment attended FOR field trip
Hazel Run	B	37% of K-8 enrollment attended FOR field trip
Horsepen Run	C	15% of K-8 enrollment attended FOR field trip
Massaponax Creek	B	30% of K-8 enrollment attended FOR field trip
Muddy Creek	NA	NA – no schools in watershed
Portobago Creek	NA	NA – no schools in watershed
White Oak Run	NA	NA – no schools in watershed

Methodology

Total student participation in FOR field trips during 2016-2017 and 2017-2018 schools years, was divided by the total enrollment at all schools in each watershed in Fall 2017 to produce the result.

Sources

Field trip attendance obtained from Friends of the Rappahannock.

School enrollment obtained from Virginia Department of Education.
http://www.doe.virginia.gov/statistics_reports/enrollment/fall_membership/index.shtml

Indicator Overview	River Cleanups	Subject: Community Engagement

Why it's important

There is a never ending barrage of litter, trash, and debris coming off our developed lands. This trash can start in a parking lot, find a storm-drain, and eventually make it to a small stream which then leads to the Rappahannock River and Chesapeake Bay. Friends of the Rappahannock and several other partners host and organize multiple river cleanups across the region throughout the year. These cleanups also provide a meaningful activity for the community to engage in their local river or stream. This indicator will help local neighborhoods and community groups identify target areas for future river cleanups and other stewardship efforts. Data only includes FOR-facilitated cleanups. Watersheds without public access were not scored.

Grading Scale

Definition: FOR River cleanups completed per 10,000 population per year (2015-2017)

A	B	C	D	F	NA
>1 cleanup	0.6-1 cleanups	0.3-0.6 cleanups	0.1-0.3 cleanups	No cleanups	No public access

Results

Claiborne Run	C	0.3 cleanups/10,000 population
Deep Run North	C	No public access sites
Deep Run South	A	0.5 cleanups/10,000 population
England Run	A	16.7 cleanups/10,000 population
Falls Run	A	0.3 cleanups/10,000 population
Hazel Run	D	0.8 cleanups/10,000 population
Horsepen Run	C	No public access sites
Massaponax Creek	D	0.1 cleanups/10,000 population
Muddy Creek	B	No public access sites
Portobago Creek	C	No public access sites
White Oak Run	D	No public access sites

Methodology

Only FOR-facilitated river cleanups during the period between 2015 and 2017 were included. The total number of cleanups within the watershed, divided by the estimated population of the watershed, divided by 10,000, divided by the number of years of data considered produced the result.

Sources

River cleanup records obtained from Friends of the Rappahannock.

Indicator Overview	**Road Crossing Signage**	Subject: Community Engagement

Why it's important

Every opportunity to engage our communities with their local waterways is important. One of the simplest ways is through small, routine signage. The vast network of roads in our region crosses thousands of creeks, streams, and the Rappahannock River. Without any signage, the smaller waterways go unnoticed, and are treated as out of sight, out of mind. If our communities know the name and multiple locations of a local waterway, they have the opportunity to become a steward. This could be as simple as not littering, not fertilizing a lawn, or even organizing a local river cleanup.

Grading Scale

Definition: Percent of crossings between lined roads and perennial waterways which are marked with the stream name.

A	B	C	D	F
>=50%	40-50%	30-40%	20-30%	<20%

Results

Claiborne Run	C	3/9 crossings marked (33%)
Deep Run North	A	1/2 crossings marked (50%)
Deep Run South	F	0/2 crossings marked (0%)
England Run	F	0/3 crossings marked (0%)
Falls Run	C	2/6 crossings marked (33%)
Hazel Run	A	3/6 crossings marked (50%)
Horsepen Run	F	0/2 crossings marked (0%)
Massaponax Creek	F	1/16 crossings marked (6.3%)
Muddy Creek	A	1/2 crossings marked (50%)
Portobago Creek	F	0/1 crossings marked (0%)
White Oak Run	D	1/5 crossings marked (20%)

Methodology

All roads with center lines were selected, and intersected with perennial stream crossings. Google Street View was used to assess whether each crossing location was marked with the stream name.

Sources

Road layers were obtained from local county GIS websites.

USGS National Hydrologic dataset 2016. https://nhd.usgs.gov/NHD_High_Resolution.html